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ABSTRACT

This document is a collection of papers whose theme is sports safety. Section one, "Government Interest in Sports Safety," includes an article on Washington, D.C.'s focus on sports safety. Section two, "Medical Aspects of Safety in Sports," includes articles regarding the medical basis of restriction from athletics, orthopaedic restrictions, and neurological concerns in contact sports. Section three, "Product Safety," includes articles on the progress of the National Operating Committee on Standards for Athletic Equipment, obstacles in setting product testing standards, and the purchaser's dilemma. Section four, "Educational Standards in Sports Medicine," includes articles relating to the education of sports physicians and to certified curriculum in athletic training. Section five, "Athletic Injury Report," includes an article on reporting sports injuries. Section six, "The Female Athlete," includes articles on the nature and incidence of traumatic injury to women in sports and on safeguards and injury controls for the female athlete. Section seven, "Legal Considerations in Athletic Programs," includes articles on school and coach responsibilities in athletics and on the rights and responsibilities of team physicians. Section eight, "Supervision of Sports Programs," includes articles on safety in interscholastic athletic programs and on community involvement in athletic safety. IPD)

CURRENT SPORTS MEDICINE ISSUES

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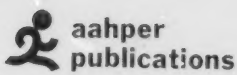
CURRENT SPORTS MEDICINE ISSUES

Timothy T. Craig
Editor

Proceedings of the National Sports Safety Congress
Cincinnati, Ohio
February 15-17, 1973



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FOREWORD

The Safety Education Division of AAHPER publishes annually a *Safety Education Review* that contains under a common jacket a variety of meaningful presentations on safety related to the responsibilities and opportunities of educators. This year's edition is devoted to sports safety to capitalize on the excellent program of the First National Sports Safety Congress held in Cincinnati in February 1973.

The Congress was sponsored by AAHPER via the Safety Education Division, its conception going back to 1970, as one means of implementing the recommendations of the Division's newly published text-reference, *Sports Safety*. As ideas for program and format of the Congress began to mature, it became evident that the focus should be on helping educators face the real issue of today: *accountability* for encouraging young people to accept the calculated risks of organized physical activity. Legislation and litigation in this regard have captured the active attention of relevant organizations, but there had been a lack of assistance from educators in developing standards for the controls being demanded. The Congress' purpose was to present this issue of accountability and the activities of those who have been facing it, and to enlist the assistance of educators that had been lacking.

To help accomplish this purpose, many organizations sent representatives to the Congress, and grants were awarded by the Congress' two cosponsors—the Division-Community Injury Control of the United States Public Health Service, Cincinnati, Ohio, and the Sports Medicine Foundation of America, Atlanta, Georgia. The Foundation was founded in 1972 as a nonprofit agency to receive and disperse monies for significant research and educational activities. AAHPER and the participants at the Congress are grateful for the support of these and other organizations which enabled their representatives to participate.

We are also grateful for the extensive time put into the planning of the Congress by Chairman Loft and the AAHPER staff, and into their proceedings by Edith Craig. It is the intent of the Division to continue the Congress concept on a periodic basis to focus attention on the many issues revealed in our first Congress. The work of these individuals and others on the committee has created a receptive atmosphere for realizing this goal.

KENNETH C. CLARKE
VICE PRESIDENT, AAHPER

ACKNOWLEDGMENTS

Sincere gratitude is expressed to all speakers who participated in the National Sports Safety Congress. The following speakers, whose presentations are not contained in these proceedings, gave exemplary oral reviews of pertinent sports safety topics:

L. William Combs, M.D., The Physician—Athletic Trainer Relationship
Robert Holland, Certification of Coaches
Fred L. Allman, Jr., M.D., The Need for Uniform Terminology
John Fleming, The Hazards of Unstructured Recreational Activities
Daniel Hanley, M.D., The Future of Sports Safety

Special thanks is extended to the following organizations and representatives for their participation:

Amateur Athletic Union — James Glick, M.D.
American Academy of Orthopedic Surgeons — Royer Collins, M.D.
American Academy of Pediatrics — Melvin L. Thornton, M.D.
American Academy of Physical Medicine and Rehabilitation — John Utz, M.D.
American Association for Health, Physical Education, and Recreation — Kenneth S. Clarke
American College of Sports Medicine — Allan Ryan, M.D.
American College of Surgeons — Nick Giannestras, M.D.
American Dental Association — William Heintz, D.D.S.
American Medical Association — Timothy T. Craig
Little League Baseball — Creighton Hale
National Athletic Trainers Association — Otho Davis
National Council of YMCAs — Lou Drexler
National Federation of State High School Associations — Dave Arnold
National Junior College Athletic Association — Kermit Smith
National Safety Council — John Fleming
President's Council on Physical Fitness and Sports — Dick Keelor

The presiding officers, with diversified and extensive health and safety experience, provided interesting leadership topic discussions.

C. Everett Marcum
AAHPER Vice President-elect
West Virginia University
Morgantown

A. E. "Joe" Florio
AAHPER Past President
University of Illinois
Urbana

Dolores Billhardt
Ohio Athletic Association
Columbus

James Crowe
Indiana University
Bloomington

Charles McMullen, M.D.
Joint Committee on Health Problems
in Education
National Education Association —
American Medical Association
Loudonville, Ohio

Grateful appreciation is also extended to the discussion leaders who gave so willingly of their time to make the conference a very fruitful experience. The conception of the Congress program was due in large measure to Kenneth S. Clarke, vice president of AAHPER. The Committee which developed and organized the Congress was composed of the following persons:

Bernard L. Loft, Congress Director
Indiana University Center
for Safety and Traffic Education
Bloomington

Timothy T. Craig, Congress Coordinator
American Medical Association
Chicago, Illinois

Robert L. Holland, Local Coordinator
Ohio Department of Education
Columbus

Joseph Sullivan, Assistant Coordinator
Xavier University
Cincinnati, Ohio

The staff of the AAHPER made a significant contribution in effecting a smooth running Congress.

John Cooper, Consultant
Julian Stein, Consultant
Carol Nichols, Program Assistant
Wanda Burnette, Program Assistant

TIMOTHY CRAIG
EDITOR

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GOVERNMENT INTEREST IN SPORTS SAFETY

Washington's Focus on Sports Safety*

Honorable John E. Moss
United States House of Representatives
Washington, D.C.

At one time or another every person purchases products for himself and his family. In this sense, everyone has a very direct interest in consumer safety in the marketplace. Consumerism is fast becoming a powerful force in the United States. As this country's gross national product has increased, so have consumers' voices been heard in the halls of Congress.

But it has not always been this way. In 1906, for example, before House hearings on the first pure food and drug bill, a man wishing to speak was asked by a committee member, "Whom do you represent, sir?"

"The people," he answered.

"What people?" he was asked, and his answer filled the chamber with laughter.

"The people of the United States," he said.

"I'm sorry we can't spare you any time," the committee member explained. "We have a number of gentlemen here representing special interests affected by this bill and we must devote what time we have to them."

In those days the leaders of American industry could hold the consumer in contempt. William H. Vanderbilt could say (and get away with it), "The public be damned" and J.P. Morgan could brazenly announce, "I owe the public nothing." Henry Ford was reported to have told a consumer that he could have any color car he wanted as long as it was black. A few years later Charlie Wilson declared, "The business of America is business."

Since the turn of the century, however, America has undergone a revolutionary transition from an agricultural society to an industrial society. The smokestack, not the plow, now symbolizes America's emergence as an industrial power. The land of individual craftsmen and self-sufficient families became a nation of assembly lines, middlemen and mass production.

These changes in the marketing system have resulted in mixed benefits to the consumer. They have made it possible for the average American to own not only a washing machine and refrigerator but a pair of skis, a set of golf clubs and maybe

*This keynote address was presented by Michael Lemov. Reactors to the address were Thomas E. Shaffer, M.D., Columbus, Ohio; John Pont, Northwestern University, Evanston, Ill.; and David C. Rust, attorney at law, Sacramento, Calif.

a snowmobile. In addition, his children probably have cleats, pads, a football helmet and a TV set — substituting for a coach.

As a result, we now live in an age of more leisure time. We enjoy the highest standard of living the world has ever known.

But at the same time the industrial revolution has created widespread consumer dissatisfaction and a variety of less-than-safe products. Our highly impersonal marketplace is often difficult for individuals to cope with or understand. Indeed, many people long to return to the horse and buggy days, which in some ways may not be a bad idea.

The buggy, for example, was usually well constructed and built to last. There was no deliberate planned obsolescence. Few buggies had to be recalled by the manufacturer, and if a part went wrong, it could usually be repaired by the friendly, local blacksmith for a fair price.

The horse also had definite advantages. It would usually start, even on cold mornings and could go long miles on grass. No oil was needed, and the only additives were an occasional apple or lump of sugar. Each horse offered a different color and style and all came with an automatic fly swatter. There were few paved roads in those days, but at the turn of the century a horse and buggy in downtown New York City could average 5.2 miles per hour, while today an eight cylinder, 300 horsepower automobile averages less than 4 miles per hour. Perhaps most important, to my knowledge there was not one horse in America named Lemon.

After the death of the horse and buggy age, a gradual interest increased consumer interest and eventually consumer legislation. President Kennedy initiated the current consumer era when he set out four basic rights of the American consumer: the right to safety, the right to be informed, the right to choose and the right to be heard.

In the past few years alone, Congress has enacted the National Motor Vehicle and Traffic Safety Act, the Fair Packaging and Labeling Act, the Wholesome Meat Act, the Truth-in-lending Act, the Motor Vehicle Information and Cost Savings Act (also known as the "bumper" bill) and other important consumer acts of legislation.

The most recent consumer legislation, the Consumer Product Safety Act, is a landmark bill which I was pleased to sponsor in the House, along with Senators Magnuson and Moss in the Senate.

The present Administration has never advocated a truly strong Consumer Product Safety Act. It originally supported a weaker, more limited bill which would have been enforced by the Department of HEW rather than by an independent commission. When President Nixon signed the bill just before his re-election, it appeared that he had changed his views. In fact, he literally adopted it, saying it was "beneficial" and answered a "long felt need." He added it was the most significant consumer legislation enacted by the 92nd Congress. I will discuss later just how the Administration's actions have matched those post-signing words. But first I want to explain how the Consumer Product Safety Act can affect sports activities.

The Act applies to manufacturers, assemblers, importers, distributors, retailers and private labelers of consumer products. Basically, a consumer product is any article produced for the personal use, consumption or enjoyment of a consumer. Obviously it applies to sports equipment such as football helmets, skis and artificial turf.

There is no requirement that the product be produced for sale directly to a consumer, but merely that it be produced for his use. The requirement of direct sale to a consumer was originally found in the Administration's version of the bill. The change was due to the efforts of people in the sports field.

The House Subcommittee on Commerce and Finance, of which I am chairman, held extensive hearings on the safety of synthetic football turf in November 1971. Redskin wide receiver Roy Jefferson, guard John Wilbur and other players testified that most types of synthetic turf seemed to cause more injuries to players than natural grass. Ed Garvey, executive director of the NFL Players Association, and Dr. James Garrick of the University of Washington also appeared and raised some very serious questions about the safety of synthetic turf. When the subcommittee looked closely at the legislation it became clear that if the requirement of direct sale to a consumer remained in the bill, products such as synthetic turf might not be within the scope of the law. To remedy this omission, the bill was modified and such products are now covered.

The new Consumer Product Safety Act has established an independent agency — the Consumer Product Safety Commission — to administer the law. The Commission has broad powers to promote safety in the marketplace. It can commence a proceeding for the development of a mandatory federal safety standard when a product presents an unreasonable risk of injury.

It is likely that the Commission will expend much effort on federal standards for sports and recreational safety. There are more injuries to children and adolescents from participation in recreational and sports activities than from virtually any other specific cause, including motor vehicle accidents, burns and violence by others. Published reports indicate that a minimum of 630,000 persons between 5 and 17 years old are injured annually as a direct result of sports participation. If sports-related injuries to older persons are added, the figure is much higher. In view of these numbers it is surprising that relatively little effort has been expended on sports safety by the government or the private sector. This is especially true in view of the direct relationship between certain sports equipment and injuries. I'd like now to discuss the types of products to which the Commission might give attention.

Football Helmets

Data indicates that the high school injury rate, at minimum, exceeds one-half of an injury per player per year. In a recent study the University of Washington found that its football players had reported only half of their injuries resulting in disability during prior high school play. This suggests an injury rate of double the reported level, or one injury per participant per year. Furthermore, even this figure may be conservative since the University of Washington athletes surveyed were, by definition, those not injured seriously enough to terminate their athletic activities. If the high school football injury rate of one per player is correct, it means that over 900,000 males between the ages of 15 and 18 years are injured playing football each year.

Estimates of various investigators indicate that 6 to 10 percent of all reported injuries occurring at the high school and college levels involve the head. The recent report of the Joint Committee on Competitive Safeguards and Medical Aspects of Sports indicates that 61 percent of these head and face injuries involve concussions and 1 of every 40 of these concussions requires hospitalization. Projecting from an injury rate of 900,000 at the high school football level, this would yield 1,500 high school football players requiring hospitalization for concussions alone during a single season. In addition, more than half of the deaths directly attributable to football result from head injuries. There is thus no area in athletics where the relationship between a specific product (football helmet) and specific injuries (concussions) is so straightforward and dramatic.

Despite this relationship there are currently no standards, voluntary, federal or otherwise, defining the injury-reducing characteristics for football helmets. Indeed to my knowledge, no preliminary test method of any kind has yet been agreed upon. And remember, the above injury estimates deal primarily with high school and college football players; we have virtually no information regarding the frequency and severity of injuries suffered by sandlot and little league players. Conservative estimates indicate that in addition to the 900,000 high school players, there are some 40,000 college football players, 14,000 professional football players and probably more than 1 million participants in football programs at lower levels. The football helmets most often used by these younger children resemble the helmets used by college and professional players only externally. In many cases little or no attention is paid to a helmet's strength, padding or suspension system. It is inconceivable that a helmet purchased for less than $5 can provide the protection offered by one costing $40 or $50 used by college and professional players.

Minimum standards for football helmets are thus an area of immediate importance for the Consumer Product Safety Commission.

Ski Bindings

Although it is not known how many people actively ski in the United States during any given year, one can assume fairly accurately the likelihood of those skiers sustaining injury. According to published studies, the average skier runs approximately a 10 percent risk of injury during a normal season. Although only about one-third of these injuries will result in significant temporary disability, if one estimates (conservatively) the number of skiers in the United States at 5 million it can be assumed that at least 500,000 of them will be injured in some way each year, and of these perhaps 150,000 will suffer significant temporary disability. These numbers gain significance when one realizes that virtually the only people to ski are those in their productive years such as students, housewives or breadwinners. Injuries to this segment of our population have a significant economic impact.

An appreciable effort of the ski industry deals with the manufacture and marketing of releasable safety bindings. Although this type of binding has been available for about 15 years, when one looks at injury statistics from areas which maintain good records, such as Sun Valley, one is extremely hard pressed to find a significant decrease in injuries. Indeed despite a myriad of claims promising predictable release and increased safety, there is but one study in the medical literature yielding any credence to the safety claims of binding manufacturers. The study, conducted nearly 15 years ago by Drs. Hadden and Ellison, was able to show only a marginal increase in safety resulting from the use of releasable bindings and that was present only for males. Subsequent investigators have been unable to document any decrease in ski injuries resulting from releasable ski bindings.

Although the American Society of Testing and Materials (ASTM) currently has a subcommittee studying this problem, there are currently no standards regarding the manufacture or performance of ski bindings. Indeed every ski binding must have special adjustments to accommodate the various heights of boot soles since manufacturers have been unwilling thus far to agree on a standard height.

The entire problem is brought into clearer focus by the fact that 70 to 75 percent of all ski injuries involve the lower extremities, which could be prevented if the ski released from the boot at the time of fall. Studies of skiers who have sustained this type of injury show that nearly two-thirds of them reported that their bindings either did not release or released after they had sustained injuries. Studies conducted by Dr. James Garrick of the University of Washington and his associates in 14

ski areas over the past 10 years indicate that the proportion of injuries resulting from the nonrelease of bindings has remained unchanged during that period. It is obvious that ski equipment is also an important subject for the new Consumer Product Safety Commission.

Government Interest in Sports Safety

While I have discussed these facts to give you a preview of the type of actions the new Commission is likely to be engaged in, I also have ulterior motives.

First, I want to warn you of some disturbing evidence regarding a lack of commitment by the current Administration to sports safety and consumer safety. After a lot of promising words at the time the bill was passed, more than three months has passed, punctuated only by a deafening silence. The Administration has not yet named one commissioner, let alone five. A scientifically and technically qualified staff has yet to be assembled. The legislation carries an effective date of December 26, 1972. One would have thought that in view of the continuing deaths and injuries that prompted the legislation, the commission would have been named by that date. It could have been hard at work already.

The delay is disturbing. It says clearer than any words that the Administration assigns a low priority to consumer safety. I fear it means the Administration is searching for candidates it can control rather than those with independence and ability.

A further ominous sign for sports safety relates to funding. Rather than request an appropriation equal to the full authorized sum of $55 million, the Administration has asked for $30.9 million in its 1974 budget and has failed to request any supplemental funds for the balance of fiscal year 1973.

Consumer Product Safety Act

My second ulterior motive is to tell you that you have a unique opportunity to play an important role in the ultimate implementation of this new law and in the future of sports and recreational safety generally.

The Consumer Product Safety Act, unlike any other federal safety statute, is designed specifically to draw on the advice and participation of private and public organizations in the development of safety standards. The Act requires that the Commission seek offerors to develop proposed safety standards. If they are technically competent, operate fairly and follow Commission rules they may be authorized to function as a part of the Federal standard-setting mechanism. Under some circumstances they may even be compensated for their expenses.

Educational, medical and sports organizations are well suited to be offerors under the new law. In fact, they are among the best qualified groups to develop standards because they can function as an independent third force not directly involved in the production of consumer products.

MEDICAL ASPECTS OF SAFETY IN SPORTS

Medical Basis of Restriction from Athletics

Russell Lane, M.D.
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Amherst, Massachusetts

Human beings are creatures of activity, not inactivity. Physical fitness, health education, social interaction and simple fun are all part of our inherent activity, and sports, whether individual or team oriented, competitive or recreational, are the blending and cultural expression of this activity. Appropriate sports participation has something to offer everyone, regardless of sex, age or physical and mental condition.

If sports are so beneficial, why then are they criticized? Is it that the competitive thread has always been a part of sports, and competition in its crudest form has been war, and war has meant injury? The object here will be to describe how competitive sports can incorporate safety factors and thus preserve the positive factors for health and welfare and minimize the detrimental factors characterized by injury infliction.

Medical Screening Exam

To determine the proper sports placement for an individual, the physician needs to administer a medical screening exam. Such an exam should consist of the following basics:

1. A complete medical history, with special attention to factors important to the sport in question
2. A complete, specially directive physical exam
3. A complete blood count
4. A urinalysis.

Beyond these basics one can debate at great length concerning additional data to be obtained. Some physicians favor a TB skin test; others argue for a profile of blood chemistries for professional players; still others advocate a stool parasite exam for players in certain geographic locations. Whether to administer these tests depends upon the player's locale, age and sex, the sport and perhaps some research interest of the medical examiner. Individual consideration must also be given to the matter of immunizations. There are good arguments for protection against tetanus, polio, diphtheria, rabies, influenza, hepatitis and malaria. There are equally valid reasons for not needing any one or all of these.

One often hears comments about the differing levels of exam for contact sports as opposed to endurance sports or leisure sports. This suggestion is disturbing because it implies that a golfer or sailor, for example, requires a less thorough medical evaluation than a basketball player or wrestler. An undescended testicle is no less crucial a finding in a player of one type of sport than in a player of another type of sport. A complete history and physical exam, with selected laboratory tests and immunizations, irrespective of sex or sport, is primary to all athletic programs and should be performed by specially trained and qualified physicians or paraprofessionals.

Traditionally, doctors have tried to examine athletes just prior to the first sports season of each academic year. This practice has resulted in too many exams of less than ideal quality. Would it not be better to examine athletes four times during the high school and college years, with these occasions being at the beginning of the freshman and junior years? Interim evaluations of certain selected factors would be a natural adjunct to these full medical appraisals. To give complete exams at specified times during the athlete's school years fits better the concept of uniform exams irrespective of the sport involved and emphasizes the role of sports as a continuing year-round and lifelong factor in the athlete's life, not just a seasonal affair.

In trying to determine the correct sport(s) for an individual, a physician needs to recognize certain limitations based on safe participation. Every decision must be an individual case decision. For example, although it is unreasonable for blind persons to play baseball, they can, and do, ski and wheelchair amputees participate in special track meets. It might be helpful to describe some of the boundaries for medical restrictions in certain sports to give us a point of reference on which to make individual case decisions.

Matching

The first boundary involves "matching," i.e., grouping participants according to certain parameters. At times, the groupings are so natural (as by sex, age or school grades) as to be uncontested. At times, as in boxing and wrestling, matching is part of the rules of the sport. But there are other times when there should be some well-stated matching rules. This can be explained best by the concept of having either a maximum or minimum (not both) weight level in some of the junior tackle football programs.

Somewhat related to the concept of matching is the idea of having rules concerning minimum squad size in a sport like football. It is neither reasonable nor safe to allow a game between two teams when the bench strength of one squad is 4 or 5 players while that of the other squad is 30 to 40 players. Such games should never be permitted and definite rules should exist to set limits.

Much talk has been expended and many schemes have been proposed to prevent wrestlers from pulling weight. This practice of rapid shedding of weight by a wrestler, via a process of combined starvation and dehydration in the several days immediately preceding a match, is the epitome of a medically unsafe practice in sports. Yet it is far from being controlled. To prevent this practice, league officials should have a weigh-in of all wrestlers in their jurisdiction before the season starts and no wrestler should be allowed to move up or down more than one weight class during the entire season. This rule may be far from ideal, but it does have the advantage of being easy to understand and administer.

Acute Illness

The second limitation is acute illness. An athlete with an acute illness is unable to perform without increasing the chances of injuring himself and endangering the health of his teammates. The problem with acute illnesses, which are usually infectious to some degree, is to provide sufficient medical support in the sports programs to detect the symptoms early, get the athletes with such illness away from the group and treat them appropriately. The scope of conditions here range from skin infections (boils, impetigo, crabs) to influenza, hepatitis, meningitis and others.

Chronic Conditions

The next limitation involves chronic conditions. It is difficult to set definable boundaries for chronic conditions such as diabetes, epilepsy, tuberculosis, rheumatic and congenital heart disease, asthma, colitis, deafness, hypertension, cardiac arrhythmias, nephritis, leukemia or lymphoma in remission and bleeding disorders. In prescribing a sport for an athlete who has any of these conditions a doctor must have an accurate diagnosis of the athlete's condition, reasonable knowledge of the anticipated course that the condition will take in the months ahead, knowledge of the sport and its psycho-physiologic demands on the athlete and full understanding of the athlete's personality and needs. The physician must weigh compassionately the pros and cons and not be afraid to say no when necessary. Activity can be detrimental at certain times and helpful at other times. A well-controlled and supervised diabetic should not be restricted from any sport. A deaf-mute should be allowed to pursue an interest in fencing. However, a person with rheumatic mitral stenosis should not be encouraged to engage in Nordic skiing or cross-country track.

Body Organs

The fourth medical limitation for participation in certain sports involves various organs of the body. An athlete with an inguinal, femoral or umbilical hernia or a pathologically enlarged liver or spleen should be restricted until the condition is either corrected or corrects itself, as the case may be. Athletes with any of the following conditions should be encouraged to avoid tackle football, ice hockey, rugby, soccer and lacrosse:

- Single eye, single kidney, single spermatogenic testicle
- Severe myopia
- Repeated cerebral concussions of significant magnitude
- Previous brain surgery or depressed skull fracture
- Previous cervical spine fracture or dislocation.

In these conditions the danger of re-injury or injury to remaining structures is too significant to allow participation in collision (contact-*plus*) sports.

Eyeglasses

A special word must be voiced concerning eyeglasses. To exclude an athlete from his chosen sport because he wears glasses seems unfair. On the other hand, to allow glasses to be worn without a thorough consideration of whether they are the correct style and construction material for the sport and participant is equally wrong. Eyeglasses, in whatever form or material, have no place in tackle football as long as players use their heads as a battering ram. But from the various styles and materials used to make athletic frames for industrial-weight safety lenses and

from the variety of contact lenses available, surely there is a way for all but the most medically incapacitated athletes to pursue their chosen sport.

When prescribing eyeglasses for an athlete, a doctor must consider what the best frame and lens are for the particular visual defect, athlete and sport. The right glasses for sports use is not a quick decision and requires an understanding of sports safety and optometry. It is conceivable that an athlete might wear soft contact lenses for football, industrial-weight safety lenses for Alpine skiing, another style for baseball and a fourth variety of "dress" spectacles for everyday use.

In summary, activity is natural for humans and leads to physical, mental and social health. Athletics are a natural expression of human activity. The screening exam is a medical effort to direct individuals into activities—sports—which will safely contribute to their health.

Orthopaedic Restrictions to Athletics

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The purpose of administering a physical examination prior to participation in athletics is to determine if a youngster is capable of engaging in athletics, to diagnose his condition and try to remedy any defects and to be sure he does not have a condition which could result in death or further deformity if he were allowed to participate. Too often the examining physician thinks in terms of contact sports and when signing the examination card which the youngster presents to him, may disqualify him from all sports participation when he merely intends to restrict the youngster from contact sports. There are conditions which would obviate playing in a contact sport or in a sport requiring a lot of running and weight bearing. However, the same youngster may well be able to participate in a sport such as swimming, which excludes these situations, and actually he should be encouraged to do so. Those who are in the physical education field are well aware of the need for remedial athletics, but this presentation will focus on orthopaedic conditions which should restrict participation in the more vigorous contact sports.

Acute Conditions

Fractures

An acute condition is a state of health in which activity must cease until healing occurs. The obvious example of this is a fracture. It is usually very easy to keep a youngster with a broken bone from participating in a sport. Most coaches are amenable to having him sit on the sidelines as long as he is in a cast, recognizing that he cannot play until the cast is removed. As with most rules, there are exceptions when an athlete can participate if he has a cast or rigid splinting immobilizing the area. For example, many youngsters with a fractured wrist can play basketball if they wear a cast on the forearm. Practice sessions can continue until the fracture has healed and the youngsters are able to resume full activity.

The same is true with an offensive lineman who has fractured the metacarpal bones of his hand. It is possible to splint the hand with a pliable plastic splint which has been covered with styrofoam and foam rubber padding so that it has

a large bulky dressing with no unyielding material under it and very good immobilization. Since the lineman does not have to use his hand for gripping, he can participate in the game. However, a defensive ballplayer who needs to have his hands free is obviously unable to participate with this kind of immobilization. A toe fracture is also a good example of an injury which may produce some pain when the youngster is running, but is not an absolute contraindication to sports participation. If the athlete wears a good firm shoe, the fracture will generally heal very quickly and he can return to the game within the limits of pain.

Dislocations

It is much more difficult to restrict athletics when a youngster has a dislocation which has been reduced. The deformity is now gone, the athlete usually does not complain of much pain after this has been accomplished, and frequently the coach feels he is ready to play again. This is certainly the case in shoulder dislocations. However, one must understand the basic injury that occurs with a dislocation to understand better the reason for restricting activity for a four-week period. When the shoulder dislocates, it does so because soft tissues in front of the shoulder, particularly the capsule holding the shoulder joint in place, have been torn loose. In a few instances this is accompanied by a fracture. To allow proper healing, the arm must be immobilized for a period of four weeks, during which the structures in the front of the shoulder return to normal and heal. If this is not done, the recurrence rate of dislocations of the shoulder is about 90 percent. If this occurs, the athlete is no longer as effective and often surgery becomes necessary.

The same is true for dislocations of the patella. In fact, physicians who practice sports medicine are aware of the necessity for repairing them surgically even though the dislocation has been reduced because of the defect which is produced and the great tendency for recurrence. The same is true of dislocations of the acromioclavicular joint of the shoulder, in which case activity must be restricted until full healing has occurred. If the dislocation is complete and reduction cannot be maintained, surgery is indicated. Dislocations of the hip, knee and ankle are usually serious injuries and the need for restriction from athletics as well as for good orthopaedic care is obvious.

Dislocation of a finger is quite common. It usually can be pulled back into place, is relatively stable once this has occurred and may be splinted by taping the finger with an adjacent finger, giving the stability necessary to prevent recurrence and permitting the tissues to heal. This allows the athlete to return to competition because he does not have a hard cast and the officials will allow him to play. In treating dislocations of the hand, however, the physician must be certain that fracture has not occurred in the joint, as it is often necessary to operate on the fracture dislocations of the fingers with intra-articular damage in order to restore the articular surface back to normal. If this is not done, the athlete will be left with a deformed, poorly functioning joint. In dislocations of the thumb, ligaments may be torn to such a degree that there is instability. In these cases, immediate surgery may be necessary to prevent continued instability such as seen in the "gamekeeper's thumb."

Contusions

Contusions are bruises to the muscle caused by direct blows. The most familiar examples are a charley horse of the thigh and a "blocker's arm," which frequently

occurs in the upper arm. Immediately after a deep bruise to the musculature of the thigh, athletic activities should be restricted and ice applied. Rest, compression and immobilization by using crutches should be prescribed to prevent further bleeding. As soon as the athlete regains normal range of motion of the extremity without feeling pain, he can resume participation. The old notion of running out the bruise should be discarded because it leads to further bleeding and restriction of motion and may produce myositis ossificans. Once this has developed, the youngster may be unable to participate for the remainder of the season. If a deep bruise or contusion is treated adequately from the start, the youngster may be restricted from athletic activity for about four days. In some extreme cases this restriction may last for three weeks. However, if not cared for adequately, the youngster may miss the entire season.

Internal Derangements

Internal derangements include the torn meniscus and osteochondritis dissecans, which occur in the elbow or knee. A torn meniscus in the knee joint is usually a disabling condition until full range of motion has been regained. The athlete may have a locking episode and after moving his knee about, may feel something click back into place and then he has normal range of motion. There may be swelling of the knee and some pain for two or three days, following which the athlete can return to athletic activity. As long as the athlete has no restriction of motion, pain in his knee joint or persistent effusions in the joint, he can resume activity. However, if the knee continues to buckle or lock on him, his meniscus should be removed and athletic activity or weight bearing on the knee joint suspended until then.

Osteochondritis dissecans is a lesion affecting the thigh or elbow and may produce symptoms similar to those of a torn meniscus. Usually it occurs to adolescent athletes. When it occurs in the thigh, there is loss of blood in the femoral condyle and this area may become dislodged from its bed in the femur, producing a loose piece in the joint and giving symptoms of internal derangement of the knee joint. Athletic activity must be restricted and if the piece is loose, surgery is necessary. The same symptoms occur in osteochondritis dissecans of the elbow, particularly to little league pitchers. Treatment is similar.

Chronic Conditions

Chronic conditions are physical abnormalities which are either congenital or acquired and which have been aggravated by participation in sports. One must specify whether contraindications are absolute or relative. For example, a youngster with a congenitally absent odontoid process must be discouraged from participating in contact sports. In such a case, it may be necessary to fuse the youngster's spine to prevent problems should he be accidentally bumped or involved in an automobile accident.

Spine

Fractures of the cervical spine which have been fixed by surgery and fusion are absolute contraindications to any contact sport. A youngster with this type of fracture can participate in sports such as swimming, tennis or cross country.

which do not require using the head for tackling or as a battering ram. Scoliosis, or curvature of the spine, is another condition which can be disabling if it is severe. Contact sports should be restricted if surgical fusion has been performed, particularly if internal instrumentation using Harrington rods has been carried out. An athlete with this condition may be allowed to swim and engage in other activities which do not place stress on his spine. If surgery is unnecessary and the youngster is not symptomatic, athletic activities need not be restricted. In my experience youngsters wearing a Milwaukee brace, for example, with scoliosis of relatively severe degree have been allowed to remove the brace to compete in gymnastic events. Some have worn the brace while water skiing and doing other strenuous sports.

Scheuerman's epiphysitis is a condition affecting spinal growth and may produce pain and deformity such as a curved back. If a youngster is having considerable pain, athletic activity may need to be restricted for a brief period. However, most youngsters are able to continue playing football without any difficulty provided they avoid activities which produce undesirable symptoms. These youngsters may become symptomatic when they start a weight training program and are lifting an excessive amount, but those symptoms may disappear as soon as the weight training has stopped. If their condition becomes excessive, they may need to wear a brace to prevent the deformity which is occurring. In these cases, a youngster may not be able to participate in a sport such as football.

Spondylolysis or spondylolisthesis is another condition of the lumbar spine. If an athlete does not have pain, sports need not be restricted. Occasionally, the condition will become symptomatic and some restrictions may have to be placed on the kind of exercises that the athlete does. For example, lifting weights may produce discomfort and the athlete may have to do exercises for his low back that will allow him to participate. Some youngsters may have to wear supporting low back braces to allow them to play basketball. Some youngsters even use a supporting brace so they can participate in football. Usually this is not a disabling condition and surgery is necessary only if symptoms are severe. Once a fusion has been accomplished in this area, athletic activity may resume.

Rheumatoid spondylitis is another spinal condition aggravated by athletic participation, including running. A youngster with this condition can be permitted to swim but not engage in other sports.

Hips

Youngsters with slipped capital femoral epiphyses, Legg-Perthe's disease or congenital dislocation of the hip in which there is a fair amount of deformity should be discouraged from engaging in sports which place considerable stress across the hips. These include running and jumping sports such as basketball, track and football. If allowed to participate, degenerative changes can be hastened. Activities which do not require a great deal of weight-bearing stress are permissible and swimming should be encouraged. If the youngster is in the acute phase of any of these diseases, athletic activity must be restricted. Surgery is indicated in slipped capital femoral epiphyses which are acute and there are various forms of treatment necessary for Legg-Perthe's disease, all of which contraindicate athletic participation which is weight bearing.

Knees

Knock knees (genu valgum) and bow legs (genu varum) that are not severe are not contraindications to sports. Some people feel that athletes are recurvatum

of the knee and lax ligaments are more prone to develop knee injuries. Generally they are among the better athletes. Although athletic activity should not be restricted, the physician and physical educator must do all they can to strengthen the musculature around the joint in order to avoid injury. If these deformities are severe, however, they should be corrected before the youngster even reaches the age when he wants to participate in sports.

Legs and Feet

Many youngsters with slight limb atrophy or slight length irregularity can participate in sports very well without difficulty. Many youngsters have flat feet which never give them any difficulty and sports should not be restricted. However, if the flat foot deformity if severe and causes pain, athletic activity may need to be restricted.

Osgood-Schlatter's disease, which occurs at the knee, and other types of apophysitis which may occur in the heel, are injuries produced by traction of the musculotendonous unit on the insertion, and can produce pain. The athlete may have to limit his activity during the time that his joints are symptomatic. Rest is generally all that is necessary to allow healing. Once these apophyseal areas have closed over, activity can be resumed. While a youngster frequently is kept from playing a sport during its season because of injury, after that season he is capable of playing other sports as the symptoms have completely subsided.

General Deficiencies

Many athletes with deformities of the upper extremities are able to get along quite well because they compensate. Youngsters with a partial or entire arm missing are frequently able to participate and, in fact, should be encouraged to do so provided the deformity does not make them prone to further injury.

Any deficiencies found in the examination of an athlete, such as residuals from previous injuries or fractures with atrophy and weakness of the musculature, should be remedied prior to allowing the athlete to return to activity. For example, an athlete who has sustained an injury to the lower extremity with atrophy of his thigh musculature should not go on the playing field until the musculature has regained its full strength so that he is capable of doing all that his sport demands.

Although body build cannot be used as an absolute contraindication to participation in certain sports, it certainly helps to allow the medical examiner to discuss possible sports with a youngster's parents. For example, a tall, thin youngster or a short, obese Froehlic-type youngster may not be physically mature enough at the time of examination to participate in contact sports. If such is the case, they should be encouraged to engage in sports such as tennis, basketball and swimming which help to develop their musculature and agility. Often these youngsters become fine athletes when they have matured and their association with these agility-type sports becomes beneficial to them if they participate in contact sports at a later time.

Considerable judgment is required of the physician in deciding whether a youngster should be allowed to participate in athletics. There are no black and white areas in this matter. The physician must use his best judgment and be firm in restricting athletics when it is definitely necessary to do so.

Neurological Concerns in Contact Sports

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Trauma to the central nervous system is not a frequent injury in football when compared with injuries to the knee, ankle, shoulder or elbow but it may, and frequently does, cause not only lost playing time but also permanent incapacitation and even death. The first comprehensive survey of serious head and spinal cord injuries in football was a five-year study (1959-1963) conducted by Schneider (4). Since this report showed the need for concern about these injuries, a number of subsequent studies have been made on particular aspects of neurologic trauma (5), experimental approaches on the playing field (3), simulated laboratory studies (1,2), and prevention of serious injuries by improving equipment, particularly helmets (3).

During the course of his survey, Schneider collected 225 serious or fatal neurosurgical injuries of football players. Although sandlot players constituted the largest group and wore the least protective gear, they had only 26 (11.8%) serious injuries. In contrast, the fully protected and equipped players sustained 88.2 percent of such injuries. Does this indicate a difference in playing technique or does the helmet only provide a false sense of security? This is difficult to answer, but perhaps a closer look at some types of brain and spine injuries will help in early recognition and treatment.

Skull Fractures and Hemorrhages

A skull fracture, by itself, probably has little significance. When an injury occurs with a skull fracture, at least some of the impact force is dissipated if the skull fractures and that is force which is not transmitted to the brain. Of significance is the force transmitted to the brain and the resultant hemorrhage or damage to the brain tissue. An epidural or subdural hematoma is a collection of blood over the surface of the brain. This causes compression of vital centers for normal functions. In Schneider's study five players were diagnosed as being afflicted by an extradural hematoma and four of them died. Three of them were wearing full equipment at the time of injury. Of the subdural hematomas, there were 69 cases with 28 deaths. In 24 of these cases the time interval between injury and operation or injury and

death was only six hours. Forty-one patients were saved by operative intervention with 23 making an excellent recovery. These cases point out how critical the time factor of providing emergency treatment is with this lesion.

Fourteen intracerebral hemorrhages were recorded, and of these more than half died. The worst injuries occured to the brain stem region. Hemorrhage in the pons was fatal in 16 out of 17 cases.

Spinal Injuries

In the five-year study, 78 spinal injuries were collected. Of the fracture-dislocations, 16 had no neurological deficit and made a complete recovery. However in 30 players, a distressingly high number, the spinal injury was associated with an immediate and complete permanent quadriplegia. The other types of spine injuries carried no mortality.

Conclusion

What can be concluded from this study? It certainly is not the sandlot player without protective equipment who showed the highest percentage of injuries but the player who was fully protected. Does this indicate that the present equipment provides insufficient protection? Probably a number of factors appear to be operating and only some are: 1) recognition if an injury has occurred and the availability of emergency transportation to a hospital where neurosurgical personnel treat the player's injury, 2) understanding of the mechanism of injury and methods of prevention and 3) more effective protective equipment.

Efforts are being made not only in the treatment of these types of injuries but more importantly, in the prevention of such injuries. The problem is being studied on the playing field and in the laboratory, and the testing and improving of protective gear should lessen the tragedies that have been witnessed in the past.

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PRODUCT SAFETY

Progress of the National Operating Committee on Standards for Athletic Equipment

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The National Operating Committee on Standards for Athletic Equipment (NOCSAE) was formed at an organizational meeting held in Kansas City, Missouri in May 1970. The main objectives of NOCSAE are:

1. Promote, conduct and foster research, study and analysis and the collection of data and statistics relating to athletic equipment, with a view to encouraging the establishment of standards in the manufacture and use thereof for the benefit of amateur athletics
2. Disseminate information and promote, conduct and foster other activities designed to increase knowledge and understanding of the safety, comfort, utility and legal aspects of athletic equipment
3. Provide a forum in which individuals and organizations may consult and cooperate in considering problems which relate to athletic equipment
4. Do all of the foregoing exclusively for charitable, educational and scientific purposes.

Charter members of NOCSAE include the following organizations:

American College Health Association
National Athletic Trainers Association
National Collegiate Athletic Association
National Federation of State High School Associations
National Junior College Athletic Association
Sporting Goods Manufacturers Association
Sports Foundation

NOCSAE is an ongoing committee that plans to investigate school sports equipment thoroughly with the intention of establishing standards that will make the equipment as safe as possible for participants. The item currently under investigation is the football helmet. The study to upgrade the safety of football helmets has been going on since January 1971 at the Wayne State University School of Medicine under the direction of Dr. Voigt R. Hodgson and his associate, Dr. L. M. Thomas.

NOCSAE determined that two approaches were necessary to accomplish standards for football helmets — dynamic testing and laboratory research. Dynamic testing, which is defined as acceleration telemetry on a regular football player, is a means of recording the actual results of impacts under regular playing conditions. The

laboratory research involves the use of animals, cadavers and other means applicable to the problem.

The study consisted of three parts — development and testing of a realistic head model, football helmet drop tests using a metal head form and football helmet impacts using human cadavers. To appreciate the degree of difficulty involved, it must be understood that human testing was impossible because of nonreversible injury or death while testing. Yet if a helmet is to be judged for its ability to protect the human head, the head model must be as true to life as possible.

Creation of a Realistic Head Model

Such a realistic head form was constructed by Dr. Hodgson from synthetic materials which are similar to human characteristics in terms of weight, center of gravity location, mass distribution, skull rate and impact response. The head model is made of a multipiece skull mold of silicon rubber. Brain and sinus cavity cores are suspended by armatures inside the mold over which self-skinning urethane liquid has been poured into the void and solidified into a skull shape. Subsequent to dissolving out the brain and sinus cavities, each was statistically tested for comparison to previously tested human skulls.

A cast self-skinning urethane jaw was attached to the head mold, and the exterior of the skull and face were built up with beeswax to the thickness of human skin. A firm silicon rubber mold was made of the head. A vulcanizing silicon rubber was then poured into the mold, making a rubber skin to extend over the skull. It is unbelievable how lifelike the head model is.

Early in 1972 the new head form was ready for incorporation in the helmet standards tests. It had an impact response similar to that of the cadavers that were tested and outperformed the more commonly used metal head form. Some of the conclusions were as follows:

1. The new head form has static and dynamic response characteristics, weight and mass distribution and a shape similar to the human head and therefore is a suitable model on which human impact tolerance standards can be used to evaluate the impact-attenuating performance of football helmets.
2. The realism of the head form permits more sophisticated measurements of human injury such as pressure distribution on the head, intra-cranial pressure, angular acceleration and neck forces.
3. The use of a realistic head form that is a sensitive index to human tolerance of fracture and concussion permits life-like simulated testing to determine at what energy level a helmet can safely attenuate below these limits. The use of such a model is obviously superior to the present method of dropping a crash helmet from higher and higher energy levels, the performance criteria of which are unrelated to human tolerance levels.
4. In May 1972 the National Highway Traffic Safety Administration proposed safety standards for motorcycle helmets that are to be effective March 1973. The standards are based largely on the American National Standards Institute's specifications (Z-90.0 - 1971) for protective headgear for vehicular users. The new standard would use the present Z-90 acceleration-time standards until September 1974, at which time the requirements would be upgraded to require that the impacts meet the higher performance levels of the proposed Head Injury Criterion (HIC) of Federal Motor Safety Standard Number 208. Tests of crash helmets and modified crash helmets for football use at the Wayne State University lab revealed that whereas the HIC is based upon human

concussion tolerance standards, the old Z-90 standards are two to four times higher than human tolerance. This means that helmets which now pass the Z-90 criteria will be far from passing the criteria adopted in 1974.

To insure confidence in the practical characteristics of testing football helmets with a realistic head form, three complete drop test facility units have been built with newly designed instrumentation, head models, drop carriages and control systems. One of the units has been shipped to the Riddell Manufacturing Company, another to the Biomechanics Laboratory of Pennsylvania State University and the third, which is already in operation, is at the Biomechanics Laboratory of the Department of Neurosurgery, Wayne State University School of Medicine. It is hoped that results will be forthcoming from these laboratories in 1973.

Testing with Metal Head Forms

Prior to the Wayne State project, testing was based mostly upon crash helmet test procedures and rigid metal head forms. Laboratory tests revealed, however, that a crash helmet could not handle repeated impacts because its working parts are designed to self-destruct upon such impacts. The impact energy of a crash helmet is attenuated and put into a controllable condition by breaking down the helmet liner shell. After such impacts, the helmet can be reduced to 50 percent efficiency and certainly no one would try re-using it. This would be as absurd as having a race driver use tires with broken sidewall casings. Furthermore, a crash helmet is designed to deal with the devastating effects of steel corners, glass edges and the crushing weights of the vehicle and therefore most start working at a much higher level than a football helmet.

It would seem quite reasonable to assume that two helmets are needed and must be treated separately. In the NOCSAE study a representative group of helmets, totaling 33, including 12 different types, were tested. Tests were done to the front, side, rear and top of the head protectors. Both the best and worst helmets were resilient padded, indicating that it can be misleading, for example, to lump together in injury statistics a particular type of helmet made by different manufacturers. The energy-absorbing characteristics of different types of resilient pads and the method of designing the pad into the helmet greatly alter the impact-attenuating performance of the helmet.

As of February 1973, all of the major helmets on the market had been tested for impact-attenuating properties and the latest results can be summarized as follows:

- There is a wide difference in performance of helmets, indicating a need for upgrading standards to eliminate unsafe features of some helmets and to keep other undesirable models off the market.
- Design flaws or needed improvements were found in every helmet tested in the program.
- The results stimulated manufacturers to improve their helmets after comparing results with other types and brands and having for the first time an absolute human tolerance criterion against which to gauge the performance of their helmets.
- The tests helped the researchers to formulate test methods, tailored to the football environment, which are designed to upgrade poor helmets and based upon human tolerance. Such test methods should be ready to use by 1973.
- The problem of minimizing acceleration caused by an impact at a given location on the head was found to be in the following order for all helmets: most in the front and frontal boss and diminishing in order of rear, side and crown.

Testing With Cadavers

Cadaver tests were conducted against rigid steel, synthetic turf and wet sand surfaces to compare the metal head form with the NOCSAE head model and to develop performance standard criteria in terms of head acceleration for one of the most critical impact situations on the football field — impact to the head against hard turf. These results showed that the NOCSAE head model is suitable for testing football helmets because, unlike the metal head form, it has static and dynamic responses similar to the cadaver head.

It was found that, for the average helmet on the market today, a four-foot drop of a cadaver head onto a synthetic turf with a rigid backing produces, on the front, a level of acceleration which is considered to be at the concussion threshold. A comparison of results of impact against the head of a seated human cadaver, a dropped decapitated cadaver head, and full body cadaver drops showed conclusively that the metal head form is not sufficiently resilient to restore itself to its original shape after repeated impacts.

Observations of game films of the Detroit Lions and other teams indicate that head injuries are caused by hard impact situations such as head to head, knee to head, foot to head and unimpeded head impacts against hard turf. Simulations of these severe impact conditions are being studied to determine how football helmets can be designed to protect players from such impacts.

Conclusions drawn from tests with the cadavers include the following:

1. There are wide differences in the performances of helmets among the same types, which reveals a need for standards that would remove unsafe helmets from the market.
2. Cadaver impacts, along with a kinematics chart-concussion tolerance curve, help to bracket the upper limit of head accelerations which can be reasonably expected on the football field. (These are useful as a gauge in designing helmets.)
3. In determining safety standards for helmets it is necessary to test multiple impacts at a high performance level because football is a multiple impact game and most helmets that were tested showed a degradation of performance from beginning to end.
4. Frontal impacts produce the highest acceleration at a given location on the head, followed by the rear, side and top.
5. More extensive cadaver simulation of football impacts and model comparisons are needed for finalizing performance standards.
6. The current design of helmets has reached the point where the majority of the helmets provide concussion protection up to levels which are rarely exceeded.

Impact of the Study

The impact of the study has been immediate. Manufacturers have been stimulated to upgrade the performance of their helmets. In every case in which a helmet tested poorly, the manufacturer corrected the product and resubmitted it for a subsequent test. In all cases, the subsequent test showed that the product had been improved, and did well in the second test.

Government agencies are now preparing to take standards actions in the field of sport equipment. NOCSAE has apprised government leaders of the activities of the NOCSAE research effort and progress in writing test method standards as a result of this study. The Bureau of Product Safety, which will be responsible for the safety of football helmets designed for elementary and junior high school

students, has adopted a policy of insisting that when a product is involved, a standard must be written within 150 days by a voluntary standards group or the Bureau will adopt a safety standard for them.

The results of the study will also undoubtedly lead to the participating schools establishing helmet impact test standards in their football rules.

Future Studies

During 1973, NOCSAE proposes to extend the above work. Several types of necks including stiff, flaccid and segmented necks will be used in the study. Several segmented necks have been developed by General Motors Research Laboratories, one of which is able to duplicate the motion of the human neck in hyperflexion and another of which is able to stay within the envelope of human neck performance for hyperextension, which is the most dangerous neck injury condition. Segmented necks are expected to be available for use with the NOCSAE head model in an exchange arrangement. In the meantime, the effect of the head model response with either a stiff or flaccid neck will be investigated by measuring linear and angular acceleration of brain distortion when the head model is subjected to impacts from several directions and lines of action.

If the test method for helmets is to be truly comprehensive and effective, more information is required of the effect of various factors such as helmet weight, mass moment of inertia of the helmet, pads on the exterior surface of the shell, face mask, retention and collars on the response of the head and neck to direct and indirect impacts to the head. An example of an indirect impact would be blind-siding where the blow is to the body and the effect is transferred through the neck to the head.

Other elements affecting the performance of a helmet which require study are: (1) reconditioning, (2) degradation of performance of a new helmet after a season's play, (3) wet, hot and cold conditions, (4) cutback of helmet shells for greater visibility, (5) the effect of the helmet's hardness and shape after a drop test, (6) the effect of multiple impacts and what constitutes a reasonable number of multiple impacts, (7) the effect of various helmet sizes on different sized heads and (8) cadaver simulation of critical head-neck impact situations as determined by game injury film.

In the final analysis, NOCSAE's intention is to establish minimum equipment standards as part of the rules of each sport by making recommendations which the rules-making bodies of the various governing organizations might then incorporate into their playing rules.

Obstacles in Setting Product Testing Standards

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The problem of injury in sports has been a concern since the beginning of intercollegiate sports in colleges and universities in the latter part of the 1800s. Athletic organizations such as the National Collegiate Athletic Association (NCAA) and the National Federation of State High School Associations (NFSHA) have devoted considerable effort to promoting and legislating for greater safety in sports. They have done outstanding work in attempting to reduce injury in sports by modifying rules, upgrading officiating and promoting greater equality of competition.

The mandatory use of ear protectors in wrestling and the regulation concerning the length of cleats in tackle football are examples of recent activities in this direction. Although institutions spend millions of dollars each year on equipment for competitive sports, and game rules exist which require that certain protective equipment be worn by players, only in the past four years has there been a cooperative effort directed toward developing standards in protective equipment for sports.

One of the initial steps toward establishing standards was taken when the American Society for Testing and Materials (ASTM) organized its F-8 Committee on Protective Equipment for Sports in 1969. Today this group is active in developing standards for athletic equipment.

The ASTM is an independent organization which has been involved for more than 75 years in establishing voluntary standards. Its activities were first concerned with building materials such as steel, cement and electrical wiring. It is partly because of ASTM standards that consumers can go to a hardware store and replace a nut lost from a bicycle. The threads of the bolt are standard. While there one might also purchase a tube of glue for plastics to mend a tear in the vinyl upholstery in the car. The consumer is not deeply concerned about its adhesive properties because he has become accustomed to the protection offered by the ASTM standards for adhesives. One could cite many other examples of consumer protection, for the ASTM has over 100 technical committees and each year publishes 33 volumes of standards for products ranging from structural steel to surgical thread for repairing appendectomy incisions.

There are basically two main types of standards — compulsory and voluntary. Compulsory standards are imposed upon both consumer and producer by legislative bodies. The law requiring the installation of safety belts in automobiles and the rule specifying the maximum length of football cleats are compulsory standards.

Voluntary standards, on the other hand, involve a mutual agreement among producers and consumers. They are established and agreed upon only after two major steps have been taken. First, a standard test method must be developed and the details of its procedures described. Second, performance standards have to be established which are mutually agreeable to both producers and consumers and which are based on the best scientific evidence available. Only after the facts have been gathered and the standards expressed in clear and concise language can one expect that they will be accepted. Such procedures are complex even in highly technical engineering fields where standard tests are widely used, testing equipment is available and the ultimate use of the product can be precisely defined.

Until recently, there have been few concentrated and coordinated investigations in the field of protective equipment for sports, despite the fact that many diverse groups would benefit from the resulting conclusions. Using ASTM terminology, persons who have an interest in such an endeavor can be classified into one of three major areas: producers, consumers or general interest groups.

Producers consist of suppliers of raw materials, equipment manufacturers and distributors of equipment, both wholesale and retail. Consumers include players and coaches, team physicians and trainers, families of players and athletic organizations.

The athletic organizations are national groups like the NCAA, the NFSHA and the National Intercollegiate Athletic Association (NAIA) and regional and state groups like the Eastern College Athletic Conference (ECAC), state high school athletic associations and local conferences and leagues.

The general interest group includes individuals who are vitally interested in problems related to athletics. Included in this category are sports researchers, specialized professional medical personnel such as orthopedic surgeons, and other sports enthusiasts.

To establish standards for safety in athletic equipment, all of these groups must become involved. Currently, the athletes and coaches are almost totally dependent on equipment manufacturers to maintain quality and improve safety. Although it appears that manufacturers do the best job they can, they have access to only very limited, unorganized feedback from coaches and athletes to assist them in their task. There is no organized information clearinghouse, which is essential if effective standards are to be formulated.

Lack of essential information is the first of several obstacles to setting standards for athletic equipment. There have been only very limited efforts on the part of all interested parties to gather good data. Feedback from coaches to athletic goods manufacturers has been very limited and sporadic. Probably most feedback comes from dissatisfied consumers or from direct requests by a commercial company searching for advertising material. In most situations virtually no information is available.

The medical profession has only sparse data on human force tolerances of anatomical structures such as ligaments, muscles and bones. An exception is the information on sheer fractures of skeletal tissue resulting from the work of Frankel and Burstein at the Biomechanics Laboratory of Case Western Reserve University. How can standards be meaningful without the insertion of some quantitative values which are realistic from the standpoint of human tolerances? The problem of human tolerances is further complicated by the fact that there is considerable variation due

to age and body size. There is also a dearth of information on the impacts involved during athletic competition. Such data are vital if meaningful standards for athletic equipment are to be developed.

A second major obstacle to setting standards is the *lack of standardized test methods*. If meaningful standards are to be written, test methods must be developed which approximate the situation in which the equipment will eventually be used. With regard to football helmets, for example, a test method was developed some years ago as a basis for a standard for motorcycle crash helmets. This test involved only a small number of impacts of very high velocity on the crown of the helmet, which was mounted on a magnesium head form. Although this test has been used as a starting point for a more refined test method, it is unsuited to the establishment of football helmet standards. In football most impacts are of relatively low velocity, are delivered to the sides and front of the head and are repeated frequently during a game or practice. One should also recognize that the response characteristics of a magnesium head form to an impact are quite different from those exhibited by a human skull.

The *commercial viewpoint* is a third obstacle to overcome in establishing standards. Because of this country's free enterprise system and fierce competition in the athletic goods manufacturing business, many secrets of manufacturing processes and raw materials seem to be closely guarded. Companies capitalize on their advantages and perhaps rightly so, for often the corporation has invested many hours and relatively large amounts of resources in the form of money, personnel and equipment to develop their products. Should they be expected to share their findings with organizations that have made no attempt to research the basic performance capabilities of their products? This is an extremely serious problem which will be resolved only when commercial enterprises cooperate and collectively finance basic research which has a direct bearing on the safety features of their products.

The fourth major deterrent to developing standards is the *attitude of consumers*. A prevalent position of many coaches is that instant results must be achieved. Perhaps this stems from being accustomed to immediate action which is usually based on authoritative opinions. Adequate standards can never be developed on such a basis. Yet input from interested consumers, particularly coaches, is needed if effective athletic equipment standards are eventually to become a reality. No agreement on voluntary standards can ever be reached unless there is give and take between producers and consumers. Therefore, coaches and other consumers must exercise some patience until sufficient information can be gathered and effective standards written. Unless the coaches participate actively in standards development sessions during this stage, the resulting standards are apt to be meaningless.

A final obstacle to writing standards is *lack of continuity*. Standards problems are new, and yet there are so many of them that it is quite logical for groups to jump from one problem to another. For instance, when the F-8 Committee was organized, there was great interest in developing a standard for football helmets, probably because of previous interest in the establishment of standards for motorcycle crash helmets. Soon, however, artificial turf became a subject of vital concern, particularly since the hearing by the Subcommittee of the U.S. Congressional Committee on Commerce and Finance in 1971. Currently there is considerable interest in standards for ski bindings. Good standards are difficult to produce. Unless concentrated efforts are put forth by interested groups, adequate standards will never be forthcoming.

In summary, it seems that three major problems must be solved if effective standards for athletic equipment are to be written. First, there is a lack of knowledge

which can be overcome only by increased scientific research in this area. To alleviate this problem, research should be conducted by commercial companies, athletic organizations, and college and university athletic departments. Second, such research will require financial support. Companies, national and regional athletic organizations and athletic departments must be willing to provide such support on a cooperative basis for the benefit of all. Finally, all concerned groups must work for better cooperation. They must put aside the idea of being the guardians of special knowledge and secrets where safety is concerned. When physical injury or accidents are at stake there can no longer be any unshared secrets.

A long, hard journey lies ahead for the development of standards, but none of the problems is so great that it cannot be solved when all interested parties cooperate. Although there is much work to be done, the effort is worthwhile if the final result is greater safety in sports.

Young people who participate in athletics are entitled to the maximum safety which current expertise can provide. This is the fundamental purpose for the establishment of standards for athletic equipment.

The Purchaser's Dilemma

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What chance does the poor consumer have? Some believe that the forerunners of the typical Madison Avenue public relations man were the representatives of sporting goods manufacturers. According to them, every marketable item is better in its class and price range than any similar article manufactured by competitive companies. Take a catalog and read the descriptions of a company's $15.95 shoulder pad and its $43.95 model.

My objective is to attempt to raise some provocative questions for manufacturer and consumer alike. I surveyed 15 physical education teachers and 21 athletic coaches from 19 states to solicit information from consumers about possible problem areas that could affect the safety of participants as well as cause inconvenience to purchasers. Following are reports of their unsatisfactory experiences with sporting goods manufacturers.

Irresponsibility by a manufacturer was cited by the purchaser of a mat for free exercise and wrestling. The specifications required a mat 42' x 42' x 1". When the mat arrived, it measured 41'1" x 41'3" x 1". The border markings of the mat were to outline the official area of 396" x 396"; they were actually 38'10" x 38'8". Furthermore, although the mat was ordered June 26 and the manufacturer's representative accepted the 30-day delivery date as specified, it did not arrive until October 4. The purchasing agent for the school was notified immediately of the mat's defects and agreed that it was unacceptable. He notified the vendor on October 6 that the mat was being refused and asked that a company representative inspect the product. No one was sent and the mat was returned collect.

A new mat was ordered from a different company on October 27 and arrived November 21. Instead of the 30 days originally specified, an acceptable mat was finally delivered 144 days later. One's response may well be, "The mat should have been ordered from the latter company initially." Picture a neophyte attempting to determine which is better — ensolite, resolite, panelite, extralite or actionite. Which is best? Have laboratory tests been made? It is not certain whether this delay precipitated any injuries, but it is safe to assume that an aging mat was to be replaced or sent to a "B" team or a junior high school. Regardless of the level, someone had to improvise or do without a mat for several months. Inevitably,

problems involving safety occur with delays such as this. With Ralph Nader investigating, how long could some of the competitive industries survive using these kinds of tactics? What recourse does the consumer have when he makes a purchase in good faith?

The most common complaint of the school and college personnel surveyed was the failure of companies to deliver supplies and equipment on the agreed-upon target date. My first reaction was to discount this complaint as a safety hazard since the majority referred to uniforms. However, my opinion changed when one high school coach explained that his game uniforms were in such poor condition that portions of the pads were exposed. He said that he had placed an early order, well within the manufacturer's advertised dates for guaranteeing delivery prior to the beginning of the football season.

A California athletic director stated, "We have had to continue to advance our order dates beyond the minimums established by the manufacturers. We find we must now allow 90 days for hard goods and 180 days for soft." A Minnesota coach wrote, "The greatest failure to meet a deadline occurred when we bought some shoulder pads on an off-season close-out that were supposedly sitting on the shelf in the winter and we did not get them until midway through the football season. This inefficiency caused us to use pads that would have been reconditioned had we not been certain our new ones would be here. We had five shoulder injuries, losing two boys for the season. We should have sued."

More serious accusations concern the breakdown of protective gear despite companies' claims that their products are of superior quality. One college coach faults a well-known company's $41.95 shoulder pads, indicating that the plastic, tapered arch piece is subject to cracking just below the clavicle. He followed with a blast at ads for helmets that boast of the finest suspension but fail to mention that the hats are unpadded, resulting in lacerations. He pointed out that a well-known center required plastic surgery on his forehead after the last football season to remove a quarter-inch indentation in his forehead caused by repeated lacerations from his helmet. Another college coach cited a continuing problem of helmets cracking and accompanied this with the strangest story of the survey. He purchased the most expensive girdle pad and, after two or three weeks, the top of the extended kidney pad tended to roll inward, causing chafing and discomfort. His players solved the problem by removing the faulty pads and replacing them with knee pads. He said, "I know this sounds ridiculous, but I ordered several dozen extra knee pads for next season."

A high school coach stated, "The clear plastic face mask should be outlawed. They break when they become cold." Another coach indicated that such a mask did shatter in cold weather, imbedding a jagged piece in the upper cheek of one of his players and missing the right eye by a half inch. He referred to the masks as "shoddy and dangerous, but the catalog description sounds as if they are one of the best."

A baseball coach who had ordered shin guards for his catcher wrote, "They were due in March, arrived May 1, and the season ended May 12. After going through most of the schedule with patched up shin guards, I was very disappointed to finally receive them and discover they were not what I ordered. They would not go around my catcher's legs. In fact, they appeared to be sized for junior high or kiddie league play. I ordered the best and received the worst. We are not a large school or account, but surely we deserve better treatment than this. We will try a different company next year."

Football helmets constitute a weapon. Legal spearing has become a crushing offensive weapon. The helmet must be padded or cushioned; otherwise the progress

made in improved safety for the blocker is more than offset by the damage done to the blockee. This report was received from a California high school coach.

A physical education teacher in Texas said, "The fiberglass rails on our new parallel bars are dangerous when the students' hands perspire. We had more injuries in the two months we had the new piece than we have had in the last five years combined. We took it out of action after two months. The company we bought it from will not refund our money, so we are stuck with a translucent elephant."

An Ohio coach wrote, "I am tired of sales personnel pushing an item because the Cleveland Browns use it. That doesn't mean a damn thing to me. I want to know if it's safe, has proper fit and will meet the needs of the boys at my school, not the pro athlete. The elastic underarm straps and protective trim on the flaps of the shoulder pads caused them to shift. The flaps have sharp, cutting edges, causing some painful injuries when blocking and tackling."

From a New Jersey coach: "Reconditioning football and athletic gear is a farce. They claim to do such a good job, but they just polish and clean enough to cover the trouble areas. We get back a piece of gear that looks good and smells nice but can actually be unsafe."

A complaint was received indicating that American shoe manufacturers are no longer competitive with foreign companies. An industry representative who agreed, stated that the American football shoe last has not been changed in about 25 years. Finances have driven many coaches to Japanese and European football and track shoes, even though these lasts were not developed for American boys' feet. Concern was expressed for the possible crippling of athletes who wear improperly fitted shoes several hours a day over an 8- to 10-year period.

Some companies manufacturing such items as weight machines and lockers develop new models and immediately cease stocking replacement parts for their former products. The purchasers of this expensive equipment improvise in an attempt to keep it operable and frequently create hazardous conditions for lack of a three or four dollar cable assembly or a striker bar. Could the manufacturers of such items as automobiles, television sets and washing machines survive if they did not continue to make and stock parts for their older models?

In researching this topic, I was very encouraged at the degree of concern for the participants' safety by both consumers and manufacturers. The various committees and commissions studying problem areas and minimal standards deserve high commendation. The depth of their studies is laudable. Although the various organizations sharing mutual interests and concerns have, at times, worked independently and duplicated efforts, fortunately there appears to be a trend toward coordination. As a note of caution to groups working on the safety aspects of sports equipment, I quote from the minutes of one of the national commissions: "The results of the tests were not made known, but were referred back to the individual manufacturer." Unless research groups want the committees attempting to establish standards to work in the dark, the results of tests must be shared. When a problem develops in a particular model of automobile, there is a public announcement. The consumers of sports equipment deserve nothing less.

The consumer should purchase equipment from reputable firms that he knows will stand back of their products. He should buy brand name merchandise of good quality and change only after he has tried a less expensive product under similar conditions and found it to give comparable protection. This Congress should establish a simple instrument for reporting faulty equipment, false claims for products or unethical conduct by manufacturers' representatives. The Congress should appoint a committee on standards with appropriate representation from manufacturers, professional teachers, coaches and medical personnel. I would urge an amalgamation

of the various committees and commissions researching our problems and the establishment of a national standards board with authorization to enforce minimal safety standards. It is much better for us to rid ourselves of the "drop shipment," basement boys than to have an external agency do it for us.

Manufacturers should establish a strong watchdog committee with authorization to constantly review questionable conduct and claims of the industry and its representatives. Wouldn't it be a boon to the entire industry to have its own bureau of standards with growing prestige as consumers recognized its seal of approval as a sign of quality? The bureau could insist on product testing and establish minimal standards before releasing any new or changed items as approved by the bureau. Manufacturers could protect the legitimate representatives and salesmen from the marginal operators who are invading the field in increasing numbers. They could police their own ranks and rid themselves of manufacturers' representatives who obtain a second and third company's related but noncompetitive line while ostensibly representing the parent company.

A strong code of ethics should be adopted with enforcement authorization delegated to a representative board. In the limited survey previously cited, many respondents alluded to ethical problems. For example, it was suggested that price shaving be eliminated and gifts to purchasers be strongly opposed. Certainly we are aware of the vigorous opposition to dealers agreeing to shipping deadlines which they know cannot be met. Catalogs should be revised and descriptions should clearly indicate possible inadequacies of less expensive items as opposed to the top of the line. Companies developing new models of equipment with movable parts should be required to stock replacements for a minimum number of years.

Although some of these recommendations are already in progress, an increased effort to achieve and expand these objectives should be made. Consumers are tired of waiting. Consumer research commissions are broadening their responsibilities at the state and federal levels and could reach our discipline if public demands are not hushed. In November 1972 the American Medical Association voted to support peer review. We can wait no longer to adopt a similar approach to provide the best protection possible for all sports participants.

EDUCATIONAL STANDARDS IN SPORTS MEDICINE

The Education of Sports Physicians

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In the United States there is no nationally recognized standard of accreditation for the specialization of sports medicine. The subject is not taught as a special branch of medicine in medical schools, and in many it is never even referred to. The only formal medical school course that I am aware of is an elective in the fourth year at the University of Wisconsin Medical School. There are no internships and residencies in sports medicine, although in at least one medical school some residents are being involved for part of their training in a type of perceptorship in this area.

Perhaps one reason for the lack of such programs is that there has been difficulty in defining the area of knowledge and practice encompassed in the term sports medicine. I have had physical educators, physiologists, physical therapists, athletic trainers, coaches and others ask whether they could take a course in sports medicine with me. I would define sports medicine as an area of special interest which is part of the practice of medicine. Both the content and application cut across the fields of the professionals mentioned above, as well as sociology, psychology, history and other disciplines.

The field of sports medicine includes medical supervision of athletes and sportsmen, the prescription and supervision of physical education and exercise for the handicapped, and the use of sports and exercise as a means of therapy and disease prevention. Medical supervision of sportsmen should be taken in a broad sense to include all who might consult a physician regarding their sports interest and participation. The prescription of special physical education requires close cooperation with the physical education specialist. Exercise prescriptions for the prevention and treatment of disease require the active collaboration of the exercise physiologist. The physician applies his medical orientation to their expertise.

How is the interest of physicians and others involved in sports medicine being catered to in the United States? Other than by the course and preceptorship training previously mentioned, the demand is being met to a limited extent by one- to three-day meetings organized by medical societies, medical schools or other medical bodies such as the American Academy of Orthopaedic Surgeons. These meetings are devoted primarily to demonstrations and lectures which include a broad spectrum of topics dealing mainly with the medical supervision of athletes. Some are organized as formal postgraduate courses with a substantial tuition charge; others are open to

the public free of charge or with a nominal fee. Conferences which deal with exercise as a preventive and therapeutic mode are ordinarily organized separately from those which deal with supervision of athletes. Coaches, trainers, physical educators, exercise physiologists and others are generally welcome to attend these meetings and courses. Many are attended by medical students and house staff if they are held at or near university hospitals.

Since there is no standardization of these conferences and courses, the subjects vary widely but tend to cluster around the more popular and critical topics, such as knee injuries and the prevention of heat illness, to the neglect of equally important but less attractive topics such as prevention and treatment of ankle sprains; diagnosis and management of low back pain, shin splints and stitch in the side; treatment of muscle spasms, sinus infections and ear problems in swimmers; and management of chronic and recurring tendonitis. A person may attend a number of such meetings and hear the same subjects presented by different speakers over and over again. Persons and institutions presenting such programs on an annual basis face the challenge of making each year's offerings different enough to attract those who return regularly, and at the same time covering the key subjects for those attending for the first time.

Who are the sports physicians in the United States? The great majority are engaged in private medical practice, ranging from general or family practitioners to those as highly specialized as ophthalmologists. They are involved chiefly in the care of high school athletes, either as team or personal physicians. A smaller number work in college or university health services and deal with intramural, club and intercollegiate athletes. A still smaller group work with professional athletes or serve public recreational facilities such as ski areas. This is in contrast to the situation in Europe, South America, Asia and Africa where the control of amateur sports is a function of the state and the physician is a full-time state employee in this field. Most physicians engaged in the prescription of exercise for the prevention or amelioration of chronic disease or as therapy are cardiologists or physiatrists. More and more, however, physicians in private practice of general or internal medicine are being asked by their patients for recommendations about participation in sports and exercise.

What is the best background for a physician who wishes to devote most or all of his time to sports medicine? First, he should be someone who knows and loves sports. Previous personal participation in sports at any level of competition is highly desirable since it is difficult to understand the feelings of a sports competitor without the experience of having been one. A genuine love for sports is necessary to overcome feelings of frustration and impatience with many of the things that happen or are common practices in sports.

Second, he should understand physical education. The relationship between physical education and competitive sports should be a close one, but it is not always so. A sports physician should understand the factors involved in teaching and learning sports skills, including the scientific basis for motor development and kinesiology. Otherwise he may be unable to diagnose how certain situations develop acutely or chronically in certain athletes, and what the best means to avoid or correct them might be.

Third, he should have an interest in and understanding of exercise physiology. It is difficult to understand the many different programs of training and conditioning proposed and followed today unless one is thoroughly familiar with fundamentals of muscle physiology and development, cardiopulmonary potential and response to exercise, and nutritional requirements for physical activity. The physician is in a poor position to advise athletes if he does not have this knowledge.

With regard to previous medical experience, a background of family practice or general practice is by far the best. Approximately three-quarters of the problems which athletes present to sports physicians are not traumatic in origin, and many are more of a psychological than a physiological nature. The basic need in the medical supervision of sportsmen is for a primary care physician. A general surgeon has an excellent background for this type of work, since he is usually somewhat better qualified to manage the acute traumas, especially those which require suturing. If he plans to devote himself to sports medicine, he may, however, have to cut back on other phases of his surgical practice in order to be available when needed.

The role of the orthopedic surgeon should be that of a consultant. He should not have to perform routine physical exams, advise on training and conditioning, counsel athletes and coaches, or treat nontraumatic illness or even many of the less serious acute and chronic traumatic conditions. Rather he should test traumatic conditions requiring his technical expertise, especially in surgical treatment, and maintain his skills by carrying on his orthopedic practice. There may be some advantage from a diagnostic standpoint to having an orthopedist present during competition in sports where the risk of major bone or joint injury is high, but only in the role of consultant.

The pediatrician has a natural interest in the medical supervision of children engaged in sports up to age 12, and many of them are involved with teams in the younger age groupings. The typical pediatrician, however, has little time to devote to athletic teams because of other pressures of his practice. A growing specialty field related to pediatrics is adolescent medicine. The relatively few physicians who have entered this field so far have been heavily committed to private and clinic practice and it is too soon to say whether their numbers will increase to a point where they may be a significant factor in health care of athletes.

Physicians in other specialized fields are also involved in the medical supervision of athletes, usually as consultants. With the increasing participation of girls and women in sports it might be expected that some gynecologists will enter this field.

What should a training course in sports medicine include? It should include didactic instruction and opportunities for practical experience in working with sports teams and individual athletes. The subjects should include: (1) physical qualification of athletes for sports practice and competition, (2) physiology and pathology of athletic training and conditioning, (3) proper nutrition for all ranges of physical activity, (4) psychology of sports competition, (5) sociology of sports, (6) epidemiology of sports injury, (7) prevention of illness and injury in sports, (8) pathology of sports injury and (9) rehabilitation following sports injury. Practical experience should include seeing athletes in the office, in the training room and on the practice field or court. The student should attend competitions under the supervision of his preceptor, progressing to independent responsibility for sports teams both at home and away.

The subject matter included under the nine major topics cannot be found entirely in formal courses in any university. Certain areas can be found in courses at departments of physical education and at medical schools. Generally seminars relating to these topics have to be organized from scratch, utilizing whatever university personnel may have to contribute, usually under the direction of the program coordinator for sports medicine.

How long would it take to educate a physician in this field with such a curriculum? For five years (1967-1972) such a course was taught at the University of Wisconsin—Madison. Ten physicians completed the course, which covered eight months (September to May). They were given certificates by the University indicating the nature and extent of their training. The course was offered under the Medical

Extension Division of the university with the cooperation of the School of Education, the Athletic Department, the University Health Service and the Medical School. During their stay at the university all but one of these physicians were employed on a half-time basis in the University Health Service where they did a great deal of their practical work. They worked with all the intercollegiate and many of the club sports teams.

What has happened to those who took this course? Today all but one are actively engaged in sports medicine full-time or part-time. The other physician is taking training in rehabilitation medicine but intends to keep up his interest in and practice of sports medicine upon completion of his residency. Unfortunately, only 2 of the 10 were from the United States; both of these physicians are working full-time in university health services. Two of the foreign-born physicians have decided to practice in the United States.

What is the future outlook for the training of physicians in sports medicine in this country? There is apparently little demand for a full-time fellowship or preceptorship training extensive enough to provide a complete background in the theory and practice of this specialty. For this reason primarily, the eight-month program at the University of Wisconsin has been discontinued. We are preparing now to test whether physicians are interested enough to devote two weeks to an intensive training program in sports medicine, comprising about 80 hours of instruction, to be offered at Wisconsin in June 1973. A major disadvantage of such a course is that it lacks the opportunity for practical experience in working with intercollegiate teams in a variety of commonly practiced sports. However, by condensing the presentation of the materials, offering selected reading lists in preparation for the course, and following up with additional materials and suggestions to those who attend, the other major course objectives may be met.

If this effort is unsuccessful in attracting enough physicians to make it worthwhile, we shall have to continue to depend on the one- to three-day offerings, the growing periodical literature and the textbooks and monographs devoted to this specialty. The demand for qualified persons in the field continues to grow steadily, however, and I do not think that it can be satisfied for very long with half measures.

A Certified Curriculum in Athletic Training

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Although there is art work which attests to the on-the-spot tending of athletes by their trainers as far back as the ancient Greeks and Romans, the modern trainer who cares for athletes is a complex individual of many and varied talents. Early trainers were little more than rubdown experts and water carriers. Today, most trainers are college graduates and many hold postgraduate degrees. But this change did not occur overnight; a long process of development brought about the professional athletic trainer of today. Even in the late thirties and early forties, athletic training, as we know it today, was almost unknown.

The need for accelerated conditioning of young men in the preflight programs of the armed forces in World War II produced a new class of conditioners, or trainers. These men could well be called the fathers of modern athletic training. They conducted organized programs of physical fitness and worked with physicians in treating injuries sustained by the men in the preflight programs.

In 1950 the National Athletic Trainers Association (NATA) was formed in Kansas City, Missouri. The organization cited as its objectives:

- Advance, encourage and improve the athletic training profession in all phases and promote a better working relationship among those persons interested in the problems of training.
- Develop the ability of each of its members.
- Serve the common interest of its members by providing a means for free exchange of ideas within the profession.
- Enable the members to become better acquainted personally through casual good fellowship.

Today this organization boasts a membership of over 2,200 of which more than 800 are certified athletic trainers. To be a certified athletic trainer, one must fulfill NATA's standards of competence and pass an examination consisting of three sections — written, clinical and oral.

How does one meet the requirements to become an athletic trainer? There, too, many changes have taken place. In the early days of collegiate athletics very few

people knew much about athletic training. Colleges did not offer instruction to prepare individuals for this career. Young people who aspired to learn about the profession worked with older trainers who had gathered their knowledge through personal experience. This student-teacher ratio of one-to-one had a distinct disadvantage; too few young people were being prepared to do the work of a qualified athletic trainer. The supply could not meet the demand. This shortage caused colleges to develop programs to prepare individuals for careers in athletic training. In the United States there are currently 15 undergraduate programs for men and 3 for women; two universities offer graduate programs in athletic training. NATA has developed a curriculum which is updated annually for students desiring careers as certified athletic trainers. NATA's certification and basic curricular requirements appear on pages 41-44 of this article.

Athletic trainers serve in a dual capacity. They are the liaison between athletic and medical personnel in the program. A good athletic trainer will work with understanding with every type of young athlete and cooperate fully with coaches and team physicians. He must be in every sense of the word the expert "psychologist" in many circumstances. He should be able to administer tactfully to the needs of the stubborn or egocentric as easily as to the good-natured and mature.

An athletic trainer should possess vigorous good health to meet the demands of time and energy required by his job. He must be able to make calm decisions under extreme pressure, having the confidence in his own abilities that athletic training requires. This same confidence is thus instilled in the athletes under his care. In the same manner, he should have courage and persistence to help the injured overcome their disabilities. Self-discipline is important in moments of crisis or anger. A sense of humor may be one of the most useful qualities, as well as a keen interest in athletics and athletes.

In addition to the actual classwork suggested and the personality traits mentioned, a good trainer must know protective equipment, its proper fitting and best application. He should be an expert in the application of adhesive tape for many different purposes. He must know weight training, exercises and diets. He should make himself thoroughly familiar with all facets of athletic medicine and first aid so that he can recognize an injury and properly care for the athletes. He must keep informed of the latest methods for treatment and prevention of athletic injuries, knowing the proper use of all physical therapy modalities. Accurate records of injuries and treatments are vital to a good athletic trainer. The athletic trainer may also be called upon to develop a conditioning program for athletes.

There is an undeveloped realm in the profession which looks bright for people interested in becoming athletic trainers. Vast possibilities exist for high school trainers, as there are over 14,000 high schools engaging in football and over 19,000 high schools participating in basketball. There is a current shortage of certified athletic trainers to care for high school athletes. Because the better trained and qualified person secures the better position, persons who want to enter the profession should select courses and experiences advantageous to them for job possibilities.

In 1971 Texas passed a law licensing athletic trainers to practice in the state and identifying training as a legally recognized profession with specific qualifications and standards which are required in order to practice. This law is the first of its kind in the United States; however, other legislative action is anticipated as a result of this law. It is the intent of the Texas law to ensure the competency and qualifications of the people hired to practice the prevention and care of injuries to young athletes.

The relationship between the athletic trainer and team physician cannot be stressed enough. The trainer works very closely with and under the supervision of the physician so that a good rapport is essential for an effective training program.

New phases of athletics demand improved equipment and protection for athletes. The athletic trainers' profession should be constantly aware of the curriculum and requirements that need revision or improvement. The demand for high quality care for athletes is expected to increase in the future. As one strives to excel in athletic training, he must remember that his professional success should not be measured by financial standards but by the accomplishments and satisfactions gained through serving the needs of his fellow man.

National Athletic Trainers Association
Procedure for Certification

To become certified as an athletic trainer by the National Athletic Trainers Association, an individual must meet the requirements in one of the following Sections I, II, III or IV. *Qualification in more than one section is not required.*

Section I *Athletic trainers actively engaged within the profession* — This section deals with athletic trainers actively engaged within the profession *but* not yet certified.

The NATA definition of "actively engaged" is as follows:

A person who is on a salary basis (no fee) employed by an educational institution, professional athletic organization, or other bona fide athletic organization for the duration of the institution's school year or for the length of the athletic organization season and who performs the duties of athletic trainer as a major responsibility of his employment or whose responsibility is the teaching in a NATA approved athletic training curriculum is actively engaged in athletic training.

A person may become certified by:

1. Proof of five years of athletic training experience, beyond that as a student athletic trainer on an undergraduate level (effective July 1, 1975)
2. Passing an examination which includes the basic principles of athletic training
3. Proof of graduation from an accredited four year college or university
4. By presentation of a letter of recommendation from an NATA certified athletic trainer
5. By presentation of a letter of recommendation by his acting team physician
6. Proof of two years of continuous active membership in NATA immediately prior to application for certification

Athletic trainers actively engaged in the profession should *be encouraged* to continue their education toward an advanced degree and/or certificate in an AMA approved allied health profession. (Programs leading to certification as a physical therapist, orthopedic assistant, medical assistant, etc.) These individuals should attend workshops in advanced techniques in athletic medicine approved and/or sponsored by the AMA, APTA, ACSM, NATA and other accredited organizations.

Section II *Students who have graduated from an approved undergraduate or graduate program*, who have met the following criteria:

1. *Completion of the NATA approved athletic training curriculum requirements*, and proof of a Bachelor's degree from an accredited college or university
2. Have spent a minimum of two years under the direct supervision of NATA approved supervisors
3. Passed an examination which includes basic principles of athletic training
4. Proof of two years of continuous Active or Student membership in NATA immediately prior to application for certification.

Athletic trainers certified in Section II should also *be encouraged* to continue their education toward an advanced degree and/or certificate in an AMA Allied Health Profession and other activities mentioned in Section No. I.

Section III *Physical therapy degree graduate* – Physical therapy graduates may be awarded certification provided they meet the following requirements:

1. A minimum of two years experience in athletic training, beyond that as a student athletic trainer on a secondary school level, under direct NATA approved supervision.

2. Proof of a Bachelor's degree from an accredited college or university
3. By the passing of a required examination which includes basic principles of athletic training
4. Proof of two years of continuous active or student membership in NATA immediately prior to application for certification.

Athletic trainers certified under Section III should *be encouraged* to continue their education toward an advanced degree and other activities mentioned in Section No. I.

Section IV *Apprenticeship* — Students of athletic training may qualify for certification by:

1. On the job training (minimum 1,800 hours) under direct supervision of a certified NATA member
2. Passed an examination which includes basic principles of athletic training
3. Proof of a Bachelor's degree from an accredited college or university
4. By presentation of a letter of recommendation by his NATA immediate supervisor
5. By presentation of a letter of recommendation by his acting team physician
6. Proof of two years of continuous active or student membership in NATA immediately prior to application for certification.

Students who complete the apprenticeship program should *be encouraged* to continue their education toward an advanced degree and/or certificate in an AMA Allied Health Profession and other activities mentioned in Section I.

Section V *Special consideration* — Any member who has passed an athletic training course or presents evidence of successful completion of an NATA approved workshop for credit and has satisfied the requirements for a state teaching license with at least a minor in Physical Education and/or Health Education may *be endorsed* as a secondary school athletic trainer.

All NATA Athletic Trainers should be encouraged to continue their education toward an advanced degree and/or certificate of an AMA approved allied health profession and other activities mentioned in Section I.

Endorsement may be extended to full certification when requirements of any other section are met. Application for full certification must be initiated within five years of initial endorsement or endorsement shall be terminated.

Basic Curriculum Requirements

In the NATA approved program of education, the athletic trainer should be encouraged to act as liaison with the departments of physical education and student health. The program includes a major study in physical education and necessary courses required by the states for a teaching license. Also entered in the degree program are prerequisites for entry to schools of physical therapy as suggested by the American Physical Therapy Association. *The basic minimal requirements as recommended by NATA are as follows:*

I. A major study including teaching license in physical education and/or health education variable by states
   - A. Total of 24 semester hours in laboratory physical, biological and social sciences
     1. Biology — zoology (anatomy and physiology) — 8 hours
     2. Physics and/or chemistry — 6 hours
     3. Social sciences (at least 6 hours in psychology) — 10 hours
   - B. Electives strongly advised
     1. Additional biological and social sciences
     2. Physical education such as group activities and dancing
     3. Hygiene
     4. Speech.

II. Specific, required courses (if not included in I, these must be added)
   - A. Anatomy — one or more courses which will include human anatomy
   - B. Physiology — circulation, respiration, digestion, excretion, nerve, brain and sense organs
   - C. Physiology of Exercise
   - D. Applied Anatomy and Kinesiology — the muscles; emphasis on their function in and development for specific activities
   - E. Laboratory Physical Science — 6 semester hours in physics and/or chemistry
   - F. Psychology — one advanced course beyond the basic general psychology course
   - G. First Aid and Safety — minimum Advanced Red Cross First Aid Certification
   - H. Nutrition and Foods
     1. Basic principles of nutrition
     2. Basic diet and special diet
   - I. Remedial Exercise, Therapeutic Exercise, Adapted Exercise or Corrective Exercise — exercise for atypical and/or both temporary and permanent handicaps
   - J. Personal, Community and School Health
   - K. Techniques of Athletic Training — basic general course (acceptable course for all coaches)
   - L. Advanced Techniques of Athletic Training
     1. Special course for athletic training candidates with full academic background
     2. Laboratory practices (6 semester hours credit or two years equivalent work of 600 clock hours).

III. Recommended courses
   - A. General Physics
   - B. Pharmacology — specific side effects of drugs

C. Histology — tissues and methods of studying them
D. Pathology — laboratory study of tissues in pathological condition
E. Organization and Administration of Health and Physical Education Programs
F. Psychology of Coaching
G. Coaching Techniques —
   1. Highly recommended — football, basketball and track coaching technique courses
   2. Also recommended — courses in baseball, soccer, wrestling and preferred sports by geographic areas.

ATHLETIC INJURY REPORTING

Sport Injuries Reporting: Methodology and Design

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Football injuries have always been accepted as a by-product of participation in the game, even though many of these injuries can be prevented. Many hypotheses for the cause of injuries and their prevention have been developed but none has been adequately tested. Because of this situation, the North Carolina High School Football Study was initiated.

This study, conducted at the University of North Carolina, is the first attempt to apply accepted research design techniques to an increasing health problem in schools. For the first time in athletic medicine research, data will reveal the difference between injured and noninjured participants.

Many studies have dealt with the problem of athletic injuries but most of them have been primarily descriptive and have not related such factors as protective equipment or coaching experience to athletic injuries. Gordon's classic paper in 1949 first suggested epidemiological analysis, similar to the procedure used in studying infectious and chronic disease, for use in accidental injury analysis (1). Haddon conducted an epidemiological study on skiing injuries at Mount Snow, Vermont and was able to point out two groups, beginners and females, as having high injury rates (2). There have been no such studies in tackle football, but Kraus conducted an epidemiological investigation of intramural touch football injuries at the University of Minnesota in 1967 (3). This study was important in demonstrating that epidemiological methods can be used in the area of sports injuries.

The North Carolina High School Football Study was conducted in the state's public schools from August 1968 to May 1973. The study population was a stratified cluster sample of student athletes from 43 North Carolina high schools, selected from the 347 schools fielding teams. The random sample was stratified to include small rural schools, consolidated rural schools and larger urban schools.

Collection of data included four separate areas: 1) demographic data on all members of the study population, 2) objective data on protective equipment on all members of the study population, 3) data on members of the study population who were

injured each football season and 4) data concerning background and experience of the schools' coaches.

Demographic data were obtained through a guided interview with each athlete and included information on age, race, height, weight, history of football trauma, medical examination, playing experience and other personal characteristics. Data on personal protective equipment were obtained by visiting each school during practice and examining each boy to record information on make, model, fit, condition and wearing habits with respect to each piece of protective equipment.

Information on injuries was obtained by direct interview. An investigator visited a select number of schools at least once each week, beginning during early practice and continuing to the end of the season. At that time he interviewed any players who had been injured since his last visit. For the purposes of the study, an *injury* was defined as one which occurred as a result of participation in an organized football program at the high school level and which either received medical treatment or resulted in restriction of the player's usual activity for one day beyond the day of injury.

Information on the coaches was obtained through a questionnaire completed at the coach's leisure. The purpose was to study the relationship of the players' injuries to the certification, teaching, coaching and playing experience of their coaches, with a view toward reducing the severity and frequency of these injuries through a better understanding of the coaches' role in injury prevention.

In addition to the North Carolina Football Study, the Annual Survey of Football Fatalities is compiled at the University of North Carolina. The study was initiated in 1931 by the American Football Coaches Association (AFCA) to make football a safer and more enjoyable sport. Its cosponsors are AFCA, the National Collegiate Athletic Association and the National Federation of State High School Athletic Associations.

Throughout the year, upon notification of a suspected football fatality, immediate contact is made with appropriate officials. The data collecting forms are returned and in many cases include cover letters giving additional information. At the conclusion of the football season, this information is compiled into an annual report and made available for distribution. The report is sponsored by AFCA. It includes information on the number of fatalities directly related to football, age of players, activity engaged in, part of body involved and specific location of the injuries.

Because of this survey, football has realized many benefits regarding rule changes and improvement of equipment. A few specific results are: 1) high school players are required to wear mouth guards, 2) college and university teams are required to practice in shorts for the first three days of preseason drills to acclimate players to heat, and 3) regulations control the number of practice days each team can have before its first game.

The North Carolina Football Study and the Annual Survey of Football Fatalities have had a positive effect on the University of North Carolina and on the State of North Carolina. Within the last year the university has developed a Sports Medicine Program which is responsible for the complete medical care of varsity athletes on a year-round basis. This includes all 21 varsity teams (14 for men, 7 for women). In addition, it is responsible for orthopedic injuries sustained by any student engaged in university-sponsored events, such as required physical education classes, intramurals and club activities. Emergency first aid is also made available to any student using physical education or athletic facilities. The Sports Medicine Program has the services of one full-time physician and the half-time services of an orthopedist as well as four full-time trainers. One of the trainers is certified in physical therapy and is in charge of physical rehabilitation.

The program is concerned with three primary responsibilities — service, education and research. The first year has been so successful in the area of service that the program is now focusing on the education area. Curriculum planners are developing a program for athletic trainers. As in all university departments, research will be an integral part of the Sports Medicine Program.

The North Carolina Department of Public Instruction also began to realize the extent of the sports injury problem; it created a new position of State Director of Sports Medicine and held a Governor's Conference on Athletic Injuries.

When the magnitude of football participation throughout the country is understood, it is not difficult to accept that the problem of football injuries is of significant proportions to warrant additional study. It has been estimated that if the injury ratios available were applied nationally, the present injury rate would represent from 200,000 to 400,000 injuries to football players each fall. Any health problem affecting this many players annually should be the concern of administrators, physicians and researchers. Additional epidemiological studies are important to provide new data on all areas of football activity.

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THE FEMALE ATHLETE

Nature and Incidence of Traumatic Injury to Women in Sports

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What are the five most common injuries that women receive in sports and with what frequency do they occur? This is a difficult question, as there have been very few articles written on injuries to women in sports. Yet it is important that we try to answer it, for, with the upsurge in women's participation in sports, new areas of interest have developed in conditioning, injury prevention and management. Women physical education instructors are demanding more training in these areas. But before practical athletic training for women can be included in a college curriculum, there has to be an understanding of the nature of injuries women sustain in sports.

As an athletic trainer, certified by the National Athletic Trainers Association, I have worked in the Division of Sports Medicine on a two-year surveillance of injuries to women participating in intercollegiate competition at the University of Washington in Seattle. The Division of Sports Medicine is directed by an orthopedic surgeon and is staffed by four certified athletic trainers who are also registered physical therapists, four research athletic trainers, a statistician and several orthopedic residents. Its major responsibilities are service, education and research.

The service responsibility consists of providing complete medical care for 750 male and 250 female athletes, 200 ballet dancers and the university students referred from the student health service. The medical care consists of supervising conditioning programs and administering first aid, definitive treatment and rehabilitation. In addition to serving as a women's athletic trainer, I also act as physical therapist for the student body.

In the area of education, the staff teaches a course in athletic training in the Department of Physical Education. Workshops are given for the benefit of high school and college physical education instructors, nurses and student athletic trainers; seminars are held for team physicians. Members of the staff supervise student athletic trainers, physical therapy students, medical students and orthopedic residents.

Because the Division's ultimate aim is injury prevention, research is carried out and results published or presented at national meetings. Research is difficult because

of the lack of published material on women's athletic injuries; hence, the problems are not well defined.

During the past two years, I studied women's injuries for three competitive sports club teams. The three sports, chosen for the greatest potential for injury, were field hockey, basketball and track and field. The five most common injuries occurring to women competing in those sports were sprains, muscle strains, tendonitis, contusions and patellar (knee) problems. Although the patellar or kneecap problem is specific to one area of the body, whereas the other types of injuries are not, we feel that this problem is in a category by itself.

A sprain is an injury to a ligament, resulting from overstress, which causes some damage to the ligament fibers or their attachment. Sprains occurred most frequently at the ankle but were also common at the knee, fingers or thumb. Women in basketball were most often sidelined for sprained ankles.

A muscle strain is an overstretching or overexertion of some part of the musculature, be it tendon, muscle fiber or where the muscle joins the tendon. Causes of muscle strains include lack of conditioning, lack of warm-up before vigorous activity and musculature imbalance. Shin splints, which are ill-defined in most of the literature, are a strain or inflammation of a lower leg muscle. Muscle strains, including shin splints, were most often seen in track and field.

Tendonitis is an inflammation in the muscle, the tendon or the sheath surrounding the tendon. The cause is usually unaccustomed overuse, but may be also attributed to a stretch-type injury, a direct blow or an infection which produces an irritation in the tendon or tendon sheath. Tendonitis occurs commonly to women early in the season before they are adequately conditioned. Women, particularly in track, often suffer from inflammation of the tendon of one or more muscles across the ankle. Because the street shoes that women wear have higher heels than the low built shoes in which they compete, the tendon is stretched farther than its accustomed length during athletic participation and becomes irritated.

Contusions are the result of a direct blow, causing bruising of the skin and underlying tissue. They are accompanied by pain, hemorrhaging and discoloration. Contusions occurred most often in field hockey where the ball or stick traumatized many of the players' shins, thighs, hands or faces.

The fifth common problem in women's sports involves the knee. It is not, however, the torn cartilage often seen in men's sports. Women have a greater tendency towards subluxation or dislocation of the kneecap than do men for several reasons. Women have a wider pelvis, which creates a knock-kneed tendency when running or standing. The quadriceps muscles, which are the big muscle group on the front of the thigh, pull from their attachment on the front of the shin to the hip when contracting. The line of pull passes to the outside of the patella rather than through its center as it usually does in men. The result is a kneecap which tries to drift laterally when the quadriceps muscles contract. It is not true, however, that all women must therefore have this injury; there are a few more predisposing factors. 1) The patella slides in a groove between the condyles at the distal end of the femur. If the groove between the condyles is shallow or the lateral condyle is flattened, the patella has a greater tendency to slip laterally out of the groove each time the quadriceps muscles contract. 2) If the patella is abnormally flattened on its undersurface, the possibility of subluxation or dislocation is increased. 3) A previous knee injury which was not fully rehabilitated may produce an asymmetrical pull of the quadriceps muscles, creating a tendency for the patellar drift.

Another type of patellar problem common to college-age women is the softening or degeneration of the undersurface of the patella. This is called chondromalacia

and its patterns of development are similar in many respects to those of the dislocating or subluxing patella. It occurs in athletes and nonathletes, commonly in both knees. The difference between the athlete and the nonathlete is that the athlete continues to participate despite the pain, although favoring the knee, and the nonathlete limits her activities to a tolerable level. Eventually both require medical care, the athlete because she is at the point where the pain makes competition intolerable, and the nonathlete because she has gradually favored her knee to the point where climbing stairs is out of the question.

How do women's injuries differ from injuries sustained by men? Actually, the injuries are similar but the frequency patterns differ. Men receive a greater number of injuries because of their participation in body contact sports, such as football or wrestling. The incidence of head, neck and upper extremity problems in women is very low because they do not participate in such sports. Women do not compete on the rings in gymnastics, which is the apparatus contributing to a great number of shoulder problems in men athletes. Because there are a greater number of men participating in sports than women, the frequency of injury is deceiving. Men practice proportionately more times per week and have longer competitive seasons and more games per season. Therefore, it may seem that men have more injuries, but it is not truly comparable unless placed in perspective.

Another variable factor that formerly influenced injury statistics was the sports club philosophy under which women's teams operated. Because all teams were open to everyone who wanted to participate, the skill level was generally low. Much of the season was devoted to teaching the sport. There was no cutoff point for accepting new members, and latecomers missed the preseason conditioning. Attendance was not mandatory. These facts, coupled with the knowledge that there were few participants, should put the low number of injuries in perspective.

For the purposes of the surveillance study, any athlete missing or not able to participate fully in a practice or game because of an injury sustained in that sport was counted as injured. Not included were athletes who missed practice because of injuries sustained during other forms of recreational activities or because of illness.

In field hockey there were three injuries one year with an average of 17 participants and seven injuries the next year with 19 participants. The two-year average injury rate of the field hockey season (29.5 games and practices per season) was .28 injuries per participant. There were five basketball injuries one year with an average of 17 participants and seven injuries the next year with 12 participants. The two-year average injury rate of the basketball season (34 games and practices per season) was .44 injuries per participant.

In track and field there were five injuries one year and eight injuries the next year with the number of participants nine and eight respectively. The seasonal injury rate for track exceeded that of the other two sports, with an average of .78 injuries per participant in an average season of 31.5 meets and practices. The injury rates do not reflect the varying lengths of the seasons of these sports although they do take into account the number of participants.

In order to express these figures so as to adjust for both factors, one can base the rate upon the number of injuries per 10 participants per 100 exposures, which would approximate 2½ seasons. Using injury rates calculated in this manner, field hockey sustained 9 injuries, basketball 13, and track and field 25. It is important to keep in mind that our injury information was based on rather few participants and hence, relatively few injuries. Therefore, these injury rates, while reasonable estimates, should be expected to vary from year to year and from place to place.

In summary, the five most common injuries seen in women's sports at the University of Washington in field hockey, basketball and track and field were sprains,

strains, tendonitis, contusions and patellar problems. Because women are not involved in true contact sports, they incur fewer time-loss injuries than do men. A comparison of the incidence of injury in men's and women's sports can be made based on the number of injuries per participant per amount of exposure time. However, one must take into consideration the skill level of the athletes and the amount of time spent in preseason and off-season conditioning.

Because the study revealed that the incidence of injury in track and field appears to be higher than in basketball or field hockey, greater effort is being made at the University of Washington to establish a preseason conditioning program for women who participate in track, to reduce the number of time-loss injuries resulting from strained muscles and tendonitis. Other women's teams, such as tennis, crew and basketball, are initiating preseason conditioning programs with good results. This is one step towards prevention of injuries supported by the results of the study. Hopefully more research will be done in this area so that sports will become safer for participants.

The Female Athlete: Safeguards and Injury Controls

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An examination of research on injury controls for female athletes reveals that little has been written on the topic. Indeed the majority of available data has just begun to appear in the literature within the last two years but even this is extremely sketchy. The reason for the lack of data is fairly obvious. Only during the last 5 to 10 years has the term *female athlete* been used extensively. Women have been called sports performers, sports participants, intramural participants and club players, but not female athletes.

To call women "athletes" is significant because the word implies the highest form of sports performance. Athletics means winners and losers, competition, stress and the possibility of injury.

No longer satisfied with clubs or intramurals, females are actively seeking sports that are highly stressful, highly competitive and demanding. Professional organizations such as the National Federation of State High School Associations, the National Collegiate Athletic Association, AAHPER's Division for Girls and Women's Sports and the Association for Intercollegiate Athletics for Women are not only recognizing this desire but are pushing for women's athletic programs. Nonetheless, there are several areas of neglect, such as lack of attention to the prevention of injury as well as to training and conditioning.

Those who are involved with female athletics have not recognized the hazards which may result as women's athletics develops. These hazards would be better understood if coaches, officials and other professionals who conduct women's athletic programs had a thorough knowledge of female athletes in terms of injury potential, sport by sport.

Since there is little published data on women athletes, one should turn to evidence furnished by research on male athletes. This approach is justifiable because research in anatomy, kinesiology, physiology, psychology and sociology has not yet revealed many differences between males and females in regard to injury potential. Although there is a variation in the center of gravity between males and females, this difference does not result in the threat of greater or fewer injuries as it does dictate an adjustment by the athlete through strength development and mechanical analysis of his performance. Also, females generally have more delicate bones, muscles,

tendons and ligaments than males. Therefore, unless a female athlete conditions and trains, she can incur more injuries than her male counterpart.

Contact Sports

Because more males than females engage in contact sports, which have long been recognized as causing the greatest number and severity of injuries, the accident potential is higher for males. In some sports, however, women incur a greater number of injuries simply because more of them participate in these sports than do men. In many instances, the injury potential for men and women is similar.

Contact sports can be described in two ways to differentiate between the injury potential for males and females. Contact sports have been traditionally regarded as those which allow or demand that players push, shove, strike, hold, jump, leap or pull their opponents. These sports involve *deliberate physical contact*.

The other type of contact sport is one which, because of its structure and organization, causes *accidental contact* which may result in injury. Examples would include team sports involving many players, such as badminton, lacrosse and field hockey, and sports played by a large number of participants in a limited space, such as basketball. Traditional athletic activities for women can be categorized mainly as accidental contact sports.

Concern for injury to females caused by contact sports has been controlled exclusively through rules. For example, rules for women in the sports also played by men contain shadings of difference, usually concerning the prevention of contact by participants. These differences, however, are gradually changing so that fewer of them exist. Basketball is a prime example. Although basketball rules for men have permitted physical contact for a long while, only recently have the rules for women changed from allowing no contact to allowing brushing, and the brushing is becoming greater. This trend should be examined carefully because if contact increases, injury can result.

Regardless of criticism by active feminists who are demanding equal opportunities for women, this writer believes that a distinction must be made. The rules, game forms and officiating controls should be preserved to keep deliberate physical contact out of female sports and thus help to prevent injuries.

The accident potential in baseball is high. Collisions with other players, walls and bleachers can cause injuries to the head, wrist, elbow and fingers. The frequency and severity of ankle and knee injuries have a direct relationship to the level of competition and therefore to the stress of the play (5).

In field hockey and lacrosse, blows from sticks and balls cause bruises, often more painful than harmful. Ankle and knee injuries also occur. In the majority of other sports played by females, such as track and field, tennis and badminton, knee and leg injuries seem to be prevalent. In swimming, gymnastics and diving, the arm, back and shoulder can be injured by strains, pulls and sprains.

Need for Data

There is a crucial need for records on the types and frequency of accidents and injuries for each sport in which females participate. Admittedly some data is being collected in certain geographic areas, but this is not extensive. The DGWS Research Committee is developing a data bank. However, much more information needs to be collected if injuries to female athletes are to be prevented.

Training and Conditioning

If women can stand stressful competition, they can also sweat, develop muscle strength and enhance their cardiovascular endurance. Training and conditioning have been neglected by women athletes. Few who are not Olympic quality train or condition. Unfortunately, there are not enough female coaches and trainers to help young women to train and condition. Most of the women who conduct sports programs are uneducated; those who are knowledgeable have learned on their own without benefit of formal education.

One of the contributing factors to this situation is that women have not been allowed to prepare professionally in this area. As recently as five years ago, a colleague had difficulty taking coaching and conditioning courses as an undergraduate. My own campus has just recently required training courses for women physical education majors, although the courses have been open to them for several years. In November 1972, Cramer Products, Inc., publicized in a pamphlet what is considered to be the "first all-girl class in athletic injuries" (4).

Another factor dates back to the days when society disapproved of girls participating actively in competitive sports. It was thought to be the exclusive domain of men. In those days a girl never wore high tennis shoes, even though she may have had a history of sprained ankles. Wearing an ankle wrap or knee brace caused her to be labeled a tomboy and she was ostracized by her peers or accused of being an attention seeker. Not only were such protective devices frowned upon but girls leaped into games and contests without any prior conditioning.

In my high school days, a personal ambition was to enter a city track meet. My school did not offer track and field. When I asked my physical education teacher for help, she said she knew nothing about the sport but did give me a book. I entered the meet and while attempting the men's high jump standards, I tore several thigh muscles. Perhaps this was caused partly by incorrect performance, but it was also caused by a lack of prior conditioning and training. This injury has plagued me through the years. The worst aspect, however, has been the knowledge that proper conditioning could have prevented it.

Here again, one can learn through the experiences of men athletes. Since few physiological and psychological differences have yet been found between males and females regarding injury potential, female athletes should take a similar approach toward training and conditioning as have the men. Proper training and conditioning is one of the most important ways to prevent injuries to female athletes.

Sports Regulations

J. Duke Elkow has suggested guidelines for the prevention and control of injury (3). They are:

1. Recognize hazards.
2. Remove hazards if feasible.
3. Control hazards that cannot be removed.
4. Create no additional hazards.

Another example of neglect in women's sports that I would like to cite pertains to the fourth guideline. Traditionally, rules governing women's and girls' sports have been casually regulated. Perhaps this practice can be explained by the fact that in the past few females participated in sports, their skill level was generally low and few sports organizations catered to their interests. This situation, however, has changed; women are engaging in sports in greater numbers than ever before. Stressful situations are also increasing, thereby creating greater potential for injury.

To prevent injury so that no additional hazards are created, rules for women's sports must be specific and positive, as they are in men's sports.

To illustrate an important difference between sports regulations for men and women, consider the following statements: "The health examination is considered the priority item for the welfare of candidates for sports: Is the boy capable of strenuous, all-out effort? Participation in sports is a calculated risk and the health exam helps to minimize this risk"(1). Another statement reads: Mandatory medical examinations are an essential part of the men's athletics program health and safety requirements. Contrast these statements with the following guideline for girls and women: "Adequate health and insurance protection should be provided by the institution for all members of athletic teams" (2). Whereas the first two statements are positive, specific and directed towards a precise requirement, the last statement is vague and indefinite. Such rules and guidelines can no longer be so where females are involved in athletics. Through sports regulations the potential for injury must be ascertained, identified, controlled and prevented.

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LEGAL CONSIDERATIONS IN ATHLETIC PROGRAMS

School/Coach Responsibilities in Athletics: From the Gym to the Jury

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Certain newspaper stories have recently dramatized the problem of liability in athletics and physical education. One was about a football coach who asked a group of players to help him paint and erect goalposts. In raising the posts they hit a high tension wire which killed one player and injured several others. Another story concerns a 13-year-old boy who suffered paralyzing brain damage in a school playground fight. A superior court jury awarded the boy, described as having "an alert mind and a useless body," the largest verdict for personal injury to a single individual in U.S. legal history—$4,025,000.

There is more likelihood of liability today than ever before in our history. We know that the activities in which physical education teachers and coaches are involved are conducive to injuries. In 1970, over 552,000 interscholastic sports injuries on the elementary and secondary levels were reported. Add to this the fact that more children are participating in physical activities each year, and the picture becomes clear. With more participation and injuries yearly, increased litigation against physical education teachers and coaches seems inevitable. The mood of the courts is changing, and many state athletic associations have witnessed a new attitude regarding their rules and regulations. In past years the associations rarely lost a case when their authority was challenged. Recently, however, various associations have seen their rules invalidated and more student plaintiffs are winning lawsuits as they challenge rule after rule in the courts (2,3,4,6,7).

While every facet of athletics and physical education now seems to be vulnerable to lawsuits, several areas present particular problems. The most litigated trouble spots are supervision, instruction, unsafe facilities, defective equipment and transportation. I plan to mention some precautions we can take to help avoid expensive and damaging lawsuits, but one of the problems is that so many people believe they are immune from them.

As I read account after account of boys and girls who have been injured, I keep thinking that it could have been me who was responsible. I think of a 15-year-old boy in Monroe, North Carolina, who was helping in a track meet. He was measuring the shot put when one of the contestants, unaware that he was measuring, turned, threw the shot, hit him on the head and killed him. I thought as I read the article that it could have been me. A 13-year-old junior high school student in Burlington,

North Carolina became ill during a physical education class and died a few minutes later. The doctor stated that the girl had a past history of such attacks that affected her physical condition; unfortunately, the teacher was unaware of these attacks. Again I thought, it could have been me.

And then I think of another outstanding case which occurred in New Jersey. A fine physical education teacher took an injured student to the school nurse. He warned the class not to do anything while he was out of the room. But a 14-year-old boy ignored the warning and was injured on a fall from a springboard. He became a paraplegic as a result of the accident. He sued the teacher and the school district of Chatham and was awarded damages of $1,000,216 (1,5). In comparison, the borough of Chatham spent approximately $1,800,000 on education for all students in that borough for the whole year.

Last year I spoke in the Midwest, talking about the problems we have when the shotput and javelin areas are too near the track. This year I was speaking again at a convention when a young man stood and told the audience to listen to what I was saying because, he said, "It could be you." He told how he came back from a meeting determined to check his facilities, but two weeks passed before he got to the area because he was too busy in court being sued for over $100,000. I think the first thing to remember is that it doesn't always happen to the other person. It could be us.

Another point to remember is check facilities and activities for safety before an accident takes place. After the Wichita State and Marshall University tragedies, my desk was flooded with materials from the Federal Aviation Agency and private charter companies and airlines, all trying to set guidelines for safe air travel. In North Carolina during my first year of teaching, about 25 children were killed when a school bus collided with an ice truck on a bridge because overhanging limbs prevented the bridge from being visible. The people of North Carolina became indignant and every bus route in the state was inspected the next week. It is difficult to estimate how many lives were saved by this inspection. But the real sadness is that the bus routes were not inspected before the accident occurred and that the inspection after the accident did not save one of the 25 lives. We should be aware of situations that might occur try to prevent them and remember that it could be us.

Supervision

The first dangerous area is supervision. So many times teachers leave a classroom unsupervised. Perhaps they feel reasonably certain nothing will happen if they leave for only a few minutes. The tragic fact is that it only takes a split second for accidents to occur, and they usually do when the teacher is absent. A wise physical education teacher will leave other tasks for a more opportune time, if he is to assume responsibility for his pupils' safety. Pupils can answer the telephone for the teachers, salesmen can wait until later.

The court has made its feelings clear on the practice of unsupervised classes and has been unbending in its ruling. Administrators must adopt and enforce regulations regarding all situations in which teachers feel obliged to leave their students alone or be obligated to spend days in court.

Instruction

Another dangerous area is instruction. Isn't it tragic that the professional teacher may now be forced to defend his actions in a courtroom before the well-meaning

but often uninformed men and women who compose the jury? Is it really possible that such a jury, composed of people unfamiliar with physical education, could award a pupil $15,000 for a "roll-over-two" stunt? Can $35,000 really be given to a young boy for a wrestling injury because the teacher failed to anticipate the exact moment when that injury was about to happen? The physical education teacher is in a precarious position in many instances and usually deserves our sympathy, but too often the teacher is not blameless. In too many cases the teacher must assume the responsibility for negligent action during instruction.

I visited several teachers who were introducing tumbling instruction to novices. After a brief instruction period these teachers had their students attempt fantastically complex stunts with little regard for their safety. After 10 minutes of work on a forward roll one teacher had some of his students dive over six or seven classmates with a forward roll. That no one sustained a fracture or a broken neck was a miracle.

The court will not tolerate such incompetent instruction when injuries occur. Teachers who consistently insist on such advanced activities for unskilled youth should expect a day in court when children under their direction suffer serious injuries. It is much safer to begin with simple activities and gradually advance to more difficult ones. A wise teacher will thoroughly and patiently prepare his pupils for more advanced stunts and games. A realistic and positive approach is to warn pupils about the dangers of the activities they are about to undertake. If injuries occur, the court will give consideration to the fact that sufficient warning was made.

Equipment and Facilities

The third area of concern is defective equipment and unsafe facilities. Several years ago, after our football season was over, I went to the equipment room with a sporting goods salesman who had sold us headgear. I complained about the unusual number of players on our team who had received head injuries during the past season and indicated that I would have to change to another type of headgear if the injuries continued. He asked if I had checked the knot in the top of the headgear. I had not. He said that if it is not tied, a player can sustain a head injury. To my amazement, I found that in every headgear belonging to a player who had received a head injury the knot was untied. From that day on our head injuries decreased dramatically as we required every player to check the knot before each practice and game. This is just one illustration of how a simple practice, when observed, can reduce needless injuries.

From time to time we discovered that the padding on our seven-man sled had worn thin—that our men were actually hitting the board itself instead of the padding. In another instance we practiced on a field that had a tremendous boulder in the middle of it. Careful inspection would have eliminated this potential hazard. While running on this same field our players had to avoid a right field foul marker left over from the baseball season. We made no attempt to move it until a hard running fullback was tackled out of bounds and suffered a painful neck injury when he collided with an iron pipe. Frequently we would find that the wire screen on our baseball field was defective and that a foul tip or a wild throw would go through, causing the spectators sitting behind the backstop to scatter.

The dangerous defects we have observed are too numerous to list. The responsibility for making inspections and corrections of defective equipment and hazardous facilities needs to be delegated to a specific person. It is really a simple matter to check certain pieces of equipment, some daily, others weekly and still others monthly or yearly. The amount of inspection depends on the nature and type of

equipment used. If you make a habit of checking these things regularly you will be amazed at what you will find. But even more surprising will be the number of accidents you will prevent. Keep a systematic record of inspections and use the information in a positive way. The routine inspection will pay off. I know it isn't as glamorous as devising a touchdown play, but the knowledge that you are protecting your players will be sufficient reward.

Several years ago I spoke in Houston and was pleased when I found, a few weeks later, that a member of the audience, upon returning home, had inspected his facilities. He found a glass door six feet from the bottom of the stairs that was dangerous if a student fell and tripped. So guards were put on the door. He found pegs at the end of the gymnasium for the students to hang their coats, placed at eye level, and they were only about eight feet from the base line of the basketball court. The pegs were taken out. He found that the trampoline was left out in the corner of the gym and that the students were free to jump on it at any time without supervision. They locked it up and used it only when an instructor was present. He found problems on the playground area, overlapping play fields, volleyball and basketball being played in the same area. Students were allowed to play in the gym as soon as they suited out without any supervision. He found rotten, loose boards in the stadium, parking lots without lighting—I could go on and on. But he did try to do something about his facilities.

Several years ago I attended a football game at a stadium in which the bleachers were in terrible condition. Footboards were loose or missing, and it wasn't by chance that three students fell through the bleachers during a game. One of them is still paralyzed from the waist down. I asked several administrators in three nearby cities who was responsible for the condition of their stadiums and bleachers. No one seemed to know. Each named someone else. One man said it was the duty of the coach, another pointed to the principal, while still others said it was the duty of the maintenance staff. Too many innocent spectators become the victims of others' negligence.

It is unbelievable but true that this area is considered unimportant by most school personnel. School board members, administrators, coaches and physical educatio.. teachers must insist upon adequate inspection policies to cover athletic equipment and facilities. Definite responsibility for periodic inspection is imperative. The fact that a facility is relatively new should not preclude inspection since defects can occur at any time. Regular and thorough inspection should include all facets of the athletic program, such as tennis courts, baseball backstops and bleachers.

Someone has said that the most important job today is raising our children. It is not a job for economic or emotional misfits, for frightened, inferiority-ridden adults seeking a safe, respectable and quickly attainable social and emotional status. Being allowed to teach children should be society's sign of final approval. It is not an impossible task if we pay attention to supervision, instruction, equipment and facilities before accidents occur. If we realize that accidents can happen to us, we can prevent needless injuries and untold suffering.

I found an interesting quote from Frederick A. Fiedler in the *Wall Street Journal*, December 30, 1968.

> I can envision a subpoena being served on Mother Nature herself against a products liability claim that might arise from improper raw materials on this earth being used in a product that eventually failed or worked improperly. Hopefully that case would reach the highest court of all and be adjudicated in the manner it deserves. If not, we might just as well fold up our businesses, join the products liability plaintiffs on the other side of the bar and pray

that there is enough each remaining to be divided amongst ourselves that we can enjoy our remaining nonproductive years in the manner we so richly deserve.

Safety Recommendations

Supervision

1. School boards should adopt policies prohibiting unsupervised physical education classes and athletic practice sessions for any reason.

2. Administrators should assign adequate supervisory personnel for groups engaged in physical activities. The number of supervisors should be determined by the nature and size of the group and the type of activity involved.

3. Administrators should supervise physical education and athletic programs as well as academic subjects.

4. Administrators should work closely with less qualified physical education teachers and athletic coaches. Special supervision should be provided until the teachers and coaches become qualified.

5. Administrators should provide supervision on playgrounds and in gymnasiums before school begins in the morning, especially if rough or dangerous activities are involved.

6. Administrators should adopt rules regarding lettermen club initiations. Dangerous practices should be eliminated and an advisor held accountable for conducting safe initiations.

7. All athletic contests involving physical contact should be scheduled on the basis of equitable competition in regard to size, skill and other controlling factors.

Instruction

1. School boards should employ competent, qualified personnel for physical education and athletic programs. The standards for these important positions should be high.

2. School boards should conduct in-service training in tort liability and first aid for physical education teachers and coaches.

3. Physical education teachers and coaches should warn their students of all possible dangers inherent in the activities in which they participate.

4. Physical education teachers should follow adopted syllabi whenever possible. If a teacher deviates from an adopted program it should be based on sound reasons. Extra safety precautions should be taken.

5. Physical education teachers and coaches should not assign pupils to activities that are beyond their capability. Pupils should be assigned activities commensurate with their physical condition, size and skill.

6. Physical education teachers and coaches should give special consideration to excuses for illness and injury and not attempt to be medical specialists in judging students' physical condition.

7. Physical education teachers and coaches should prepare their pupils gradually for all physical activities and progress from simple to complex tasks in strenuous and dangerous activities.

8. Special care and training should be provided in gymnastics, tumbling and activities in which dangerous equipment is used.

Equipment and Facilities

1. School boards and administrators should set policies concerning periodic inspection of equipment and facilities. Duties must be clearly delegated and defined so that a specific person or department is responsible for the inspections.

2. Accurate records should be kept of all equipment and facility inspection. The records should include the inspector's name, date of inspection, condition of the equipment and facilities and recommendations for repair.

3. All activities involving the use of defective equipment or unsafe facilities should be curtailed or eliminated until the defects are corrected.

4. Special attention should be given to ropes, ladders, lockers and bleachers in the periodic inspection.

5. Safety rules should be adopted regulating the use of swimming pools, trampolines, springboards and other potentially dangerous equipment.

6. Athletic facilities should be maintained so that they are as safe as the academic classroom.

7. School officials should provide a safe environment for all spectators, officials and participants. Extra precautions should be taken when explosive situations may arise.

8. School officials should adopt safety rules regulating vehicular traffic on all playgrounds and other areas which pupils and spectators use. Periodic warnings should be made regarding any dangerous situation.

9. School officials should keep the sidelines at football, soccer, baseball and other athletic contests clear of unauthorized personnel. Special precaution must be taken in this area to protect spectators from injury.

10. A special official should be assigned during track meets to keep the weight areas safe.

Travel Policies

1. School officials should adopt safe rules and policies for all travel of athletic teams.

2. School officials should use commercial vehicles and competent adult drivers whenever possible.

3. When students provide transportation, only those who have safe driving records and cars free from defects should be selected.

4. School officials should insist that members of athletic teams go as a team and return as a team.

General

1. All school personnel should be familiar with tort liability as it relates to their specific responsibilities. This information should include the provisions of the state statutes regarding tort liability as it applies to physical education and athletics.

2. School personnel should use sound judgment and common sense in working with pupils and spectators under their care.

3. The guiding principle for school personnel must be concern for students' welfare in all that is done.

4. Physical education teachers and coaches should instruct their students as they would have someone instruct their own children.

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Rights and Responsibilities of Team Physicians

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I number among my friends many doctors who delight in needling me about ostensible shortcomings of the legal profession. I respond by pointing out that while lawyers were creating those magnificent documents, the Declaration of Independence and the Constitution of the United States, doctors were letting George Washington's blood to remedy his last illness.

In an effort to find cases involving team physicians and their liability, I did extensive research. Surprisingly, I found none. I then looked for textual authorities and legal articles to see if others might have discovered such cases. I found only two articles relating generally to the subject and neither of them cited any decisions, reported or otherwise, in suits brought against team physicians.

Still unsatisfied, I engaged a young lawyer to see if he might by independent research find reported lawsuits in this area. He found nothing. Finally, I called some colleagues at the Law Department of the American Medical Association in Chicago to see if they knew of any cases which had not found their way into print. They did not.

What does this absence of reported cases involving team physicians mean? First of all, it does not mean that there have been no such lawsuits, but it does mean they are a rarity. For if there were any frequency at all, one would expect at least some cases to be reported.

Why, may we ask, is there this apparent invulnerability to claimed malpractice? I think it is because a competitive sports team physician holds a unique position in the eyes and, if you will, the hearts of the athletes to whom he ministers and, indeed, of their parents as well. Team physicians are not rewarded economically; their primary interest is in helping youngsters. This awareness on the part of athletes and their parents plays a large role in protecting the physician from litigation. The professional athlete's livelihood depends upon a sound body. It is little wonder that he feels indebtedness to the team physician for guarding his well-being.

To assume that because there have been few lawsuits thus far this happy existence will continue is to blind oneself to two converging forces. First, there is a proliferation of medical malpractice claims against doctors in the ordinary practice of their profession. Second, there has been an increase in lawsuits brought by athletes against boards of education, school districts and, in the case of professionals, against the

organizations responsible for fielding the sports team. There is no dearth of lawsuits in either of these two fields and there is reason to suppose that one bright morning a plaintiff's shrewd lawyer will note the presence and availability to suit of a team physician in a case where the attorney had originally contemplated suit only against the board of education, school district or professional organization. This is most apt to arise initially when a plaintiff's attorney finds that the board of education, school board or professional organization has inadequate insurance coverage and he must look to someone else for collection. Once there is a successful recovery, be assured that journals and service letters will spread the gospel, and the floodgates will open.

To illustrate my point, let me direct your attention to a case entitled *Gemignani v. Philadelphia Phillies National League Baseball Club, Inc.*, 287 F. Supp. 465 (D. Ct. Pa., Dec. 14, 1967). In that case, a father brought suit against the professional baseball team for the death of his baseball player son as a result of uremic kidneys. The precise question before the court was the application of a two-year statute of limitations. That is unimportant here. The significance for us is the vulnerability of the team physician who examined the player in March 1959 and found the symptomatic blood condition. Neither the team nor the physician treated the condition or advised the player or his family of its existence, according to the allegations. It was this failure which allegedly precluded early treatment and permitted the condition to develop into a terminal nature. The player was given an unconditional release from the team, was hospitalized a short time thereafter and died approximately one month later. In that case, suit was *not* brought against the team physician, but I submit to you that the team physician does have an obligation to disclose to an athlete any condition which may affect his health. Having undertaken an examination, the team physician and the athlete bear the relation of physician-patient. The team physician could have been, and perhaps should have been, sued if the allegations were correct.

The tort liability of public schools and institutions of higher learning for accidents occurring during school athletic events is developed at some length in an annotation appearing in 35 ALR 3rd at page 725. Included in the annotation are many cases relating to liability at the grade school, high school and college levels. The cases are many and the awards are high.

What magical garment shields team physicians from this multiple assault, I venture no guess beyond my original comments. I prophesy, however, that like all good things, it will not last. Some day soon a claimant will shout that the emperor has no clothes.

Let's look then to the law that governs the conduct of a team physician. In the absence of definitive case law specifically pertaining to team physicians, the general principles of law relating to a doctor's responsibilities and liabilities should apply. My conclusion in this respect is supported by Bergen (1) and Willis (5).

A team physician is subject to the same potential liability as would arise in the course of his care and treatment of his other patients. While an athlete may be held legally to have assumed the risk of injury in a sporting event in which he participates, he will not be held to have assumed the risk of negligent care by the team physician nor will the athlete be held to have assumed the risks inherent in the sport if he were examined by a doctor and the doctor, through negligence, erroneously found no medical conditions making it inadvisable for him to participate in the sport.

A doctor ordinarily may not be held liable in the absence of testimony by other medical doctors affording evidential support to a finding by the jury that the doctor failed to conform to that standard of care required of medical doctors in the com-

munity. The courts have carved an exception to this rule in instances where the negligence is so blatant as not to require the ordinary proof; they have also made an exception in cases where a poor result ordinarily does not happen in the absence of negligence. This latter instance of the law raises a presumption of negligence called the doctrine of *res ipsa loquitur* (i.e., "the thing speaks for itself").

One technique used by plaintiffs' attorneys to establish a standard of care for the jury is the use of authoritative texts. The defendant is cross-examined to secure admissions with respect to proper treatment and care. There is a great amount of literature purporting to establish standards upon which a doctor may find himself impaled (2,3,4). Clever use of these books may make affirmative medical testimony unnecessary to establish the requisite standard of care.

The employment arrangements a physician may have with an athletic team vary. He may appear only during athletic contests and without remuneration. He may be under contract for payment with a professional football team and agree not only to be present during the contests and practice sessions but also to manage postgame treatment and rehabilitation of injured athletes. Even when a physician acts on a voluntary basis, he must exercise the care which a competent doctor exercises under similar circumstances.

A difficult problem arises when a team physician must decide whether an athlete injured during a game is in condition to continue to play in the game. An on-the-spot decision can be difficult, particularly when the emotions of the participants are high and the dejection of a benched athlete painfully apparent. Somewhat akin is the determination by the doctor after a preseason or pregame examination whether a player may participate. A judgment that a player is fit to participate can expose one to serious potential liability. It is recommended that a doctor, after a thorough examination, state only that his examination failed to disclose anything which would prevent the player from participating in athletics. The doctor should make no affirmative assertion as to the participant's fitness to play.

Although a physician was not sued in *Rosensweig v. State of New York*, 171 N.Y. 2d 912, Rev'd. 185 N.Y. 2d 521 (1959), one could have been and probably will be if a similar case arises again. Professional boxing in New York is controlled by the state and each fighter must be examined by a doctor of his choice from a panel of doctors chosen by the state. A fighter by the name of Flores, after a savage beating about the head, was TKO'd in a fight. Three weeks later he was examined by a panel doctor and allowed to fight again. In that fight, he again received a series of blows to the head, collapsed and once more lost the fight on a TKO. He was described as groggy immediately after the fight but appeared to be normal on examination 20 minutes later. Two days afterward an EEG was done. The interpretation was, "This is a generally good record. However, there is some slowing anteriorly. Impression normal record." Two weeks later in a rematch, he was caught with a perfect shot to the chin in the eighth round. He fell to the floor, hitting his buttocks first, then his shoulders and head. He took the full count, but was revived in the ring and went to his dressing room. There he fell into a deep coma from which he never regained consciousness. He died three days later.

Subsequent examination disclosed no massive hemorrhage, which ruled out the possibility of a single blow's causing his death. A jury awarded a verdict of $80,000 against the state of New York for negligently permitting Flores to engage in a professional fight when it knew, or should have known, that he was not in proper condition to do so. The Court of Appeals reversed this decision on the grounds that the state was not liable for the alleged negligence of its panel of doctors and that the doctors were guilty of a mere error of judgment, not of negligence. The Court of Appeals decision was on a 4 to 3 basis, which reflects the iffy state of

the law. If one judge had changed his view, the verdict of the lower court would have been upheld. If the evidence were only slightly stronger, a case of negligence rather than of faulty judgment would have been made. Finally, if the plaintiff's attorney had suspected that the state would be immune to liability, he would have sued the doctors. The next time a similar case appears in New York or elsewhere, be assured the suit will be brought against the doctors. A team physician was sued in *Mabel J. Gaeckler v. The Dallas Cowboys*, on December 30, 1971. The physician was charged with negligent orthopedic treatment. To my knowledge, this case is still unresolved.

Treatment of a patient by a doctor in the absence of consent, either express or implied, is an assault and battery and subjects the doctor to a lawsuit for damages. The doctrine of informed consent is the one upon which many suits are currently based. Its real value to a plaintiff's attorney is that it obviates the need to establish negligence on the part of the doctor; more particularly, it avoids the necessity of producing competent medical testimony that the offending doctor has deviated from the appropriate standard of care. Everyone is familiar with this doctrine as it applies to private practice and to operative procedures conducted in hospitals. The doctrine has equal application to care and treatment of athletes injured in athletic contests. It is essential that written consents be obtained by the school or organization responsible for the team, authorizing care and treatment by the team physician in connection with any injuries sustained in a game or during practice. If attention is required beyond immediate emergency care, an additional consent should be secured. Such a consent, of course, must be an informed consent. The patient or the patient's parents must be fully informed of the nature of the treatment and the risks and hazards associated with it.

Any doctor who is under written contract with a team should review the contract carefully and should have a lawyer well versed in the defense of malpractice claims examine it for areas of vulnerability. The physician must know what his obligation is under the contract. If he is required to attend practice sessions and fails to do so without providing an adequate substitute, he is vulnerable to a charge of abandonment or breach of contract. When there is no written contract, it is well to make absolutely clear what he is expected to do. A letter from the physician acknowledged by the school spelling out what he will and will not be responsible for is of great value.

I would be remiss not to discuss the question of insurance. The team physician should assure himself that the board of education or team organization has adequate insurance limits. Anything less than $1 million coverage I regard as inadequate today. Verdicts of $1.1 million and $1.7 million are commonplace. A serious injury, perhaps a paraplegic or quadriplegic, is not a rarity in football and occasionally in other sports. As long as the organization with which the team physician is associated has adequate insurance coverage, it appears in the present climate that neither the athlete nor his parents are disposed to bring suit against him. But if the team or organization which the physician is associated with has a serious claim with no insurance or inadequate limits, collectibility will require that the physician be joined in the lawsuit.

The physician's own malpractice limits should not be less than $1 million. The added expense of large limits over smaller limits is modest and well worth the peace of mind it will bring.

Not only is there an increased frequency of claims against doctors, there is also by judicial fiat an expansion of the area within which that frequency works. Current examples in Ohio will illustrate this point. In Ohio the statute of limitations begins from the time the patient-physician relationship ceases (*Wyler v. Trapl*, 25 Ohio

2d 164 (1971). In a case decided by the Supreme Court, *Melnik v. Cleveland Clinic*, 32 Ohio 2d 198 (Dec. 15, 1972), an exception was engrafted on this rule. In that case, a metallic forceps and a nonabsorbent sponge were negligently left inside the patient's body after surgery. The Court held that where a discoverable foreign object is left in a patient's body, the statute does not begin to run until after the object is discovered or, by reasonable diligence, should have been discovered. In the Cleveland Clinic case, the forceps was left in the patient during abdominal surgery in 1958. The plaintiff was last seen at the Cleveland Clinic in 1958 also. The discovery was made when additional surgery was required in 1968. One can almost foresee that the Ohio Supreme Court will eventually embrace the discovery rule in all malpractice actions, rather than the current rule which starts the statute at the termination of the physician-patient relationship.

Another case will illustrate this trend. It had been believed that a doctor employed by an industrial company or by a professional team on a salary basis was entitled to the same immunity from suit afforded the company and its employees by the Workmen's Compensation laws of Ohio. Under these laws, an employee loses his right to bring a civil suit in exchange for the certain recovery of compensation under the Workmen's Compensation laws. In *Proctor* v. *The Ford Motor Company*, Sup. C. Docket No. 73-25, two company physicians were sued along with the Ford Motor Company, it being alleged that negligent conduct by the physicians worsened the plaintiff's injury for which he had already received compensation under the Workmen's Compensation laws. A motion for summary judgment filed on behalf of Ford and the doctors contended that such a suit did not properly lie against them. The trial court granted the motion for summary judgment in favor of the doctors and in favor of Ford. The Court of Appeals of Cuyahoga County reversed the judgment in favor of the doctors, on the ground that they were not entitled to the protection of the Workmen's Compensation laws, while it affirmed the judgment in favor of Ford. That case is now before the Supreme Court to determine whether a salaried doctor of an industrial employer (or any employer) is entitled to the protection of the Workmen's Compensation laws. I believe that the Supreme Court will find he is but caution again that this is an area where the courts appear to be increasing the exposure of doctors to civil suits.

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SUPERVISION
OF SPORTS PROGRAMS

Safety in Interscholastic Athletic Programs

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Wouldn't it be interesting to query the average spectator at a high school athletic contest as to his knowledge of the rules and regulations that must be adhered to prior to the squad's appearance on the field, court or mat? Wouldn't it be interesting to query these same spectators as to their knowledge of the development of the necessary game rules for the administration of the contest? From time to time, the Wisconsin Interscholastic Athletic Association (WIAA) receives letters from parents or spectators at a high school contest asking why the Association has this or that rule. Questions such as these point out that most spectators do not realize the national scope of the rules of game administration or that such regulatory measures are necessary to ensure the physical well-being of the youngsters competing.

The physical well-being of high school athletes has been a major concern of the WIAA (as it is of every state high school athletic association) throughout its 75 years. Our schools are challenged by this purpose in the opening paragraphs of our constitution: "To organize, develop, direct and control an interscholastic athletic program which will protect, conserve and promote the health and physical welfare of its participants."

The young athletes fall under more specific requirements, as stated in the rules of eligibility:

> A boy may not participate in interscholastic athletics until there is on file for him in the Association office an examination-permit card signed by a licensed physician attesting to physical fitness as stipulated in the *Guide for Athletic Disqualification* provided us by the Division of School Health of the State Medical Society.

In other words, a boy who cannot pass the required physical examination cannot represent his school in interscholastic athletics. Questionable cases are pursued by letters to physicians and the boy's eligibility for athletics is held in abeyance until the physical requirements can be satisfied.

Another area of control for which we are responsible pertains to the regulations spelling out specific requirements for practice periods prior to actual competition. A strictly enforced requirement is that a football team have 14 separate days of

practice before its opening game, with the added recommendation that no pads or regular gear be worn during the first 3 days. There is a specified number of practices required for all sports prior to the first actual interscholastic contest and it is not an area that can be delegated to the individual school. There is an obvious need for rules in this area since it is not enough for a player to be just physically fit. He must be properly prepared to engage in his chosen sport. A player's physical condition can deteriorate during the rugged demands of a two-, three- or four-month season in a sport. However, despite efforts in the area of physical examinations and preseason practice rules, injuries do occur, particularly in contact sports.

While we receive tremendous guidance and assistance from the National Federation of State High School Associations (NFSHA), theirs is not a regulatory body. The guidelines, recommendations and suggested procedures as furnished by the Federation lend support to our eventual success in effectively enforcing regulations. The NFSHA has a very close relationship with the American Medical Association, which has been most helpful to high school associations in furnishing, often and liberally, materials relating to athletes' health and safety. Most state associations have established medical symposia and related programs to bring to the attention of coaches and athletic directors factors affecting safety, proper care for athletic injuries and prevention of such injuries.

Rules committees for contact sports assign the highest priority to rules changes and/or clarifications that involve competitors' safety. There are several committees working closely with the National Alliance Football Rules Committee that consider safety their primary target as they research rules changes. The Wrestling Rules Committee is equally concerned, and, having been a member of that committee for the past 10 years, I can attest to the fact that rules changes have been affected by a concern for the safety of the wrestlers.

Headgear is required for all wrestlers, the dental guard and face mask is required for all football players and the batter's helmet is mandatory for all high school baseball players. These rules indicate what governing bodies can accomplish if their primary concern is safety for the participants.

The WIAA, as well as most other state associations, has adopted a weight control program that curbs drastic weight cutting in wrestling. In most cases, weight control programs are effective and enforceable. The State High School Athletic Association is the only agency that can bring about enforcement of this type of regulation. Also enforceable are the regulations concerning the type of material football fields can be marked with, the distance the players' bench must be from the sideline and the type of material used in flag supports and yard markers. Such regulations are effectively enforced through governing bodies such as high school athletic associations.

How many spectators are aware of these controls which are designed to protect high school players in interscholastic competition? It is unlikely that they realize that the game rules committees work very closely with sports equipment manufacturers in the design and type of material that best provides for athletes' health and welfare. Sports equipment manufacturers meet with rules committee members at least annually to determine areas needing research and experimentation in order to improve athletic equipment. With the manufacturers' help, many state associations have participated in experiments involving various types of football shoes and cleats, face masks, dental guards and other related equipment in an effort to determine their effectiveness in reducing sports injuries.

Game rules, while assuring contestants of controlled and uniform game administration, also include provisions designed to eliminate or lessen the chance of injury.

Penalties for clipping, illegal use of hands, roughing the kicker or passer, piling on, spearing and other infractions are necessary in football from the safety standpoint. In wrestling, specific dangerous holds are prohibited and others which are potentially dangerous are stopped to avoid injuries. Rules committees expect, and are assured of, enforcement of these rules by game officials who are trained and supervised by the state high school athletic associations.

In addition to its other activities, the WIAA has operated an accident benefit plan for more than 40 years and has recorded the incidence of ankle, knee and head injuries for the past 15 or 20 years. Its statistics, which have been made available to various rules committees, research groups and manufacturers, reveal that the incidence of major injuries has generally decreased in recent years. Safety in the Wisconsin Interscholastic Sports Program exists with good reason—those responsible for administering the program are dedicated to this purpose.

Safety in Athletics: A Model of Community Involvement

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The Manassas Baseball League provides organized outdoor recreation for approximately 350 boys, 8 to 12 years of age, in the greater Manassas, Virginia area. Although the program is not affiliated with the national Little League Baseball organization, it has adopted most of the latter's official rules for league play.

Since its inception in 1965, the League has been directed by a group of enthusiastic adults dedicated to achieving two basic objectives—to implant firmly in the boys who participate the ideals of good sportsmanship and to stress that the attainment of exceptional athletic skills or the winning of games is secondary to the molding of future men.

The success or failure of any boys' athletic program rests on the shoulders of its adult supervisors and parents. However, these programs must be operated for the benefit of the boys rather than the adults who direct them.

The purpose of this paper is to present the approach taken by one community group in dealing with a potential threat to the safety of boys who pitch in youth baseball leagues. The major difference between the safety measure initiated by the Manassas Little League and those instituted by Little League Baseball, Inc.—such as batting helmets, rubber cleats and other protective equipment—is that the former inevitably change the game of baseball as it is played by older boys and adults. Implementation of such changes is certain to evoke criticism from those who place utmost importance on winning games and emulating established baseball traditions and rules.

The board of directors and team managers of the Manassas Baseball League spent many long hours during the winter of 1971-72 discussing possible changes in local pitching rules to prohibit the curve ball and limit the number of innings a boy could pitch in a single game. The official rules of Little League Baseball, Inc., used by our league prior to 1972, do not refer to the curve ball and permit boys to pitch up to six innings in a game. In international tournament play boys are permitted to pitch nine innings per game.

Our initial concerns about these rules resulted from several newspaper and magazine articles (1,2,3) dealing with the problem commonly known as "pitcher's

elbow" and from observing boys in our league throwing curve balls and sometimes facing 30 to 40 batters before being relieved by their managers. Unfortunately, younger boys aspiring to become pitchers quickly notice that many successful pitchers use the curve ball as their most effective weapon. Generally, managers have not discouraged the use of curved balls and some of them have routinely taught boys to throw curves.

The Board recognized that any change in pitching rules could be traumatic and decided to investigate both sides of the question as thoroughly as possible within the time constraints inherent in any volunteer program.

Several individuals and agencies were contacted to secure additional information on the subject. Those included Creighton J. Hale, physiologist and head of the research staff of Little League Baseball; Julian Stein, Director of Physical Education and Recreation for the Handicapped, American Association for Health, Physical Education, and Recreation; and Fred V. Hein, Director, Department of Health Education, American Medical Association. These specialists sent copies of newspaper and magazine articles and research studies listed in the selected readings of this paper. These initial contacts revealed a wide difference between the position of Little League Baseball, Inc., and the opinion of orthopedic surgeons and others in the medical community who have studied the problem. Dr. Hale of Little League Baseball, Inc., is convinced that the current pitching rules provide ample protection for boys' arms, and the organization has no plans to change them. A growing number of physicians, Ph. D.'s and laymen, however, are convinced that when a youngster throws a curve ball or pitches an excessive number of innings per game, he places an extraordinary strain on his throwing arm that can cause permanent injuries.

Copies of the articles and studies received from the specialists were distributed to all directors. In addition, several local physicians who have actively supported boys' athletic programs were contacted to determine their views on the need for change in pitching rules. One of the doctors, Fortune Odend'hal, offered to read the articles, consult with several orthopedic specialists in the area and make a presentation to the board of directors and team managers.

A special meeting was scheduled for the presentation and for questions and discussion. Dr. Odend'hal and his consultants concurred with the major thrust of the research advocating change in Little League Baseball pitching rules. He concentrated on the medical aspects of the problem and did not recommend specific rule changes. In summary, he supported the position that the throwing of a curve ball places great stress on the elbow which is likely to result in some degree of permanent disability later in life. He also agreed with the conclusion of researchers that the greatest danger to the arm and shoulder occurs when fatigue sets in. In short, the more innings a boy pitches, the greater the chance of injury.

Despite Dr. Odend'hal's persuasive presentation, a vocal minority of the board continued to oppose any modification of pitching rules. Their position was that Little League Baseball, Inc., had expertise in the field and that if changes had been necessary, steps would have been taken to correct the problem. This group pointed to the exhaustive 1967 study by the Research Division of Little League Baseball, under the direction of Dr. Hale, on the cause, nature and prevention of baseball injuries. This study indicated that elbow and shoulder injuries were reported in only .017% of all players and .0 % of all pitchers. This convincing statistical evidence was not accepted by the majority of the board because data for the investigation were taken from forms completed by league officials and attending physicians. The very nature of the injuries we are discussing is that most are not pronounced and recognizable until later in life. More importantly, the disability they cause is permanent. I am sure many of you who have had experience in coaching boys' baseball

leagues will agree that a sore arm is often accepted by the boy as the mark of a pitcher. These injuries are seldom reported to physicians or league officials. In fact, I have managed pitchers who would not report a sore arm because they knew they would not be allowed to pitch until the arm was sound.

Another concern raised by those opposed to a rule change was the view that more injuries occur from improper pitching techniques and training regimens than could ever be experienced in a game. This valid concern led to the subsequent development of a list of 13 pitching principles for parents and managers (see page 80). This list was distributed to all parents at our 1972 registration and was discussed at a preseason managers' meeting. Please note that the first principle discourages, but does not prohibit, the curve ball. The managers and board members felt that a principle would be preferable to a rule change because the latter certainly would make enforcement difficult and controversial.

At the conclusion of the special meeting, the League Commissioner requested that the rules committee members develop proposed pitching rules for the 1972 season reflecting what they believed to be the consensus on the subject. This was accomplished and the board of directors passed a rule at its January 1972 meeting to limit pitchers to three innings or 20 batters, whichever comes first. Pitchers were also limited to six innings per calendar week. This measure was adopted by the narrow margin of one vote. The close vote reflected to some extent the continuing concerns of those opposed to any rule change. However, a new concern emerged from the discussion leading to the final vote. Some individuals felt that the only equitable control should be on the number of pitches thrown in a game or batters faced rather than the number of innings pitched. Although the administrative advantage of a limitation based on innings pitched were acknowledged, it was pointed out that a top pitcher might throw as few as 30 to 40 pitches in a three-inning stint, while a less skilled pitcher might throw twice that number. These individuals advocated a number of throws (or batters) large enough to permit an outstanding pitcher on a good day to hurl a complete-game or "no-hitter," but small enough to protect the boys' arms at the point of fatigue. In short, the argument focused on how best to accomplish the objective previously agreed upon by the majority.

The meeting was adjourned without gaining full commitment to making the pitching rule work in the coming year. Convinced that greater commitment was essential, the rules committee recommended an amendment to the new rule at a meeting preceding the start of the season. This amendment simply deleted reference to the limit of three innings per game while retaining the 20 batter per game limit and the maximum of six innings per week. This rule, together with the pitching principles, were in effect throughout the 1972 season.

The most critical question to be asked about a rule change such as the one discussed in this paper is — did it work? On the positive side, adult supervisors in the league seem to have developed a growing recognition of and appreciation for the potential hazards of pitching for boys up to 12 or 13 years old. Also, the rules are preventing boys from pitching when they are fatigued. However, there is considerable evidence that the pitching principle discouraging use of the curve ball was not fully effective. Most managers and parents applied the principle while a few allowed and even promoted the curve ball. In some instances, lack of support for the rule probably was due to the fact that boys already on team rosters had used the curve in prior years and were reluctant to stop throwing it. Other boys threw curves simply because their competitors were throwing it. It is estimated that approximately 10 to 20 percent of the pitchers violated the curve ball principle despite warnings to the contrary.

A second problem cited by a few team managers was that of administering the 20 batter limitation. As expected, some difficulty was experienced in monitoring the progress of the pitcher while concentrating on all other aspects of game strategy. Most managers chose to replace their pitcher at the end of the third or fourth inning rather than permit him to pitch to the full 20 batters. This practice enabled the boy to pitch an additional two or three complete innings later in the week.

Despite these improvements, Dr. Odendhal and league officials believe that 20 batters is probably still too many. League officials and managers have observed that some boys begin to show visible signs of fatigue after throwing only 50 to 60 pitches. These signs include increased wildness, reduced velocity of the pitch and strained or altered pitching motion. Assuming that a boy might throw as many as five pitches to each of 20 batters, he could throw 80 to 100 pitches per game — too many!

The precautions taken appear to be reducing the number of sore arms in the league. We are aware of only one boy who developed a chronic sore arm condition and he has been pitching complete games and throwing curve balls since the age of eight. Proposed rule changes for the 1973 season have not yet been adopted by our board of directors. There is every indication that the Manassas Baseball League will continue to protect its young pitchers by taking necessary measures to prevent the use of the curve ball and by limiting the pitches per game to a level which will guard against fatigue and possible resultant joint injury.

Manassas Baseball League

Pitching Principles for Parents and Managers

1. Managers are expected to discourage the use of the curve ball or any other pitch which requires an unnatural delivery in practice and in league competition.
2. Parents and managers should prohibit prolonged warm-up or batting practice periods (in excess of 15 minutes) on the practice field and at home.
3. Boys should not be allowed to pitch batting practice during the first 10 days.
4. Managers should make every effort to assure that pitchers are instructed in the proper techniques of pitching. The board of directors will secure assistance to managers as requested in this regard.
5. Pre-game warmup periods should be limited to 5-15 minutes.
6. Pitchers should always warm up on level ground to assure minimum strain on the pitching arm.
7. Boys and parents should report any arm trouble to the manager.
8. Never be without a jacket. Wear it after pitching or after warming up, not during actual pitching.
9. Do not let your arm cool off in a draft.
10. Always wear a sweat shirt.
11. When warming up, gradually work to maximum efficiency.
12. The pitcher should adjust his warm-up time to the weather (shorter in warm weather, longer in cold weather).
13. Do not pitch with a sore arm. Arm soreness should not be pitched out. (Rest and heat are the best cures.)

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